SCIENCE

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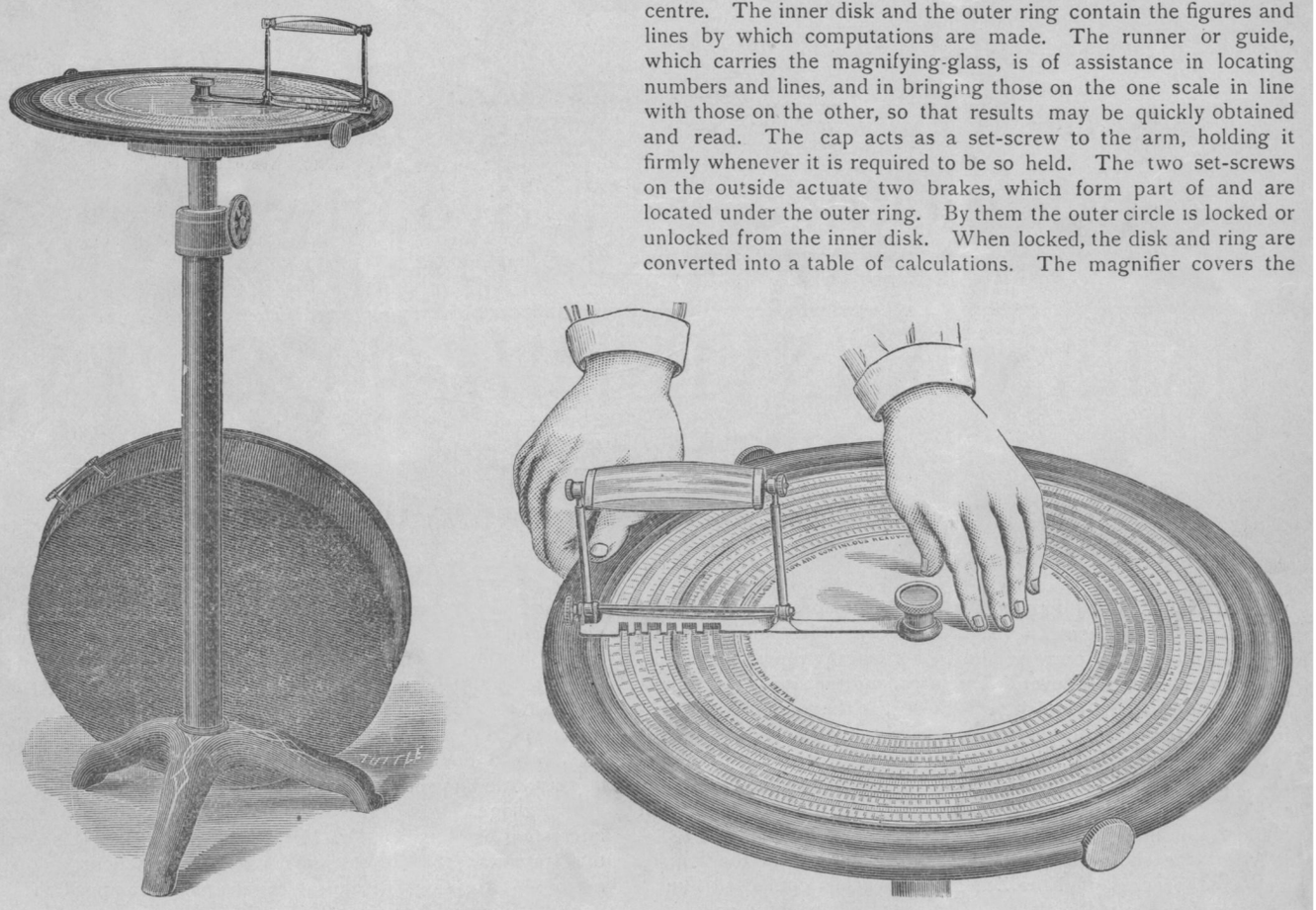
THE PROPORTIOR.

A NOVEL and exceedingly simple form of calculating-machine, called by its inventor a "proportior," is being brought to the attention of accountants, statisticians, and others, in this city. The general appearance of the device is shown by the accompanying engravings. Fig. 1 shows the instrument on its revolving stand, Fig. 2 indicates the first position in solving problems, and Fig. 3 the second position. The magnifier, by which the operator is able to read the divisions of the disk with accuracy, is clearly shown in the two latter figures, the reader being supposed to be looking toward the operator. This calculating-machine, the scale part of which is but fifteen inches in diameter, may be described as a slide rule of greatly extended length, reduced to a small circle. In the language of the inventor, it is a mechanical device which performs with ease, rapidity, and correctness, operations in commercial and mechanical arithmetic. It is further asserted to be an arithmetical library in itself, in which, for the purpose of computation, the unit can be divided into 1,000,000 parts, while the whole numbers range from 1 to 1,000,000.



FIGS. 1 AND 2.—THE PROPORTIOR.

Referring to Fig. 1, it will be seen that the outer circle rotates around the inner disk. The relation of the parts is perhaps better shown in Figs. 2 and 3, which are on a larger scale. Stops are provided by which the disk may be fastened to the outer circle at any desired point. The frame that supports the disk and circle is of metal, the disk and ring being of wood, constructed to overcome expansion and contraction, and on which is affixed the scales. The other parts consist of an outer ring, a runner or guide, a cap, two set-screws, and two brakes. The metal frame supports and holds all the other parts. The movements are adjusted to a true centre. The inner disk and the outer ring contain the figures and lines by which computations are made. The runner or guide, which carries the magnifying-glass, is of assistance in locating numbers and lines, and in bringing those on the one scale in line with those on the other, so that results may be quickly obtained and read. The cap acts as a set-screw to the arm, holding it firmly whenever it is required to be so held. The two set-screws on the outside actuate two brakes, which form part of and are located under the outer ring. By them the outer circle is locked or unlocked from the inner disk. When locked, the disk and ring are converted into a table of calculations. The magnifier covers the entire width of both scales, and is an important assistant to the sight in reading the finer divisions. It is mounted upon the runner, and is adjustable.

The operation is as follows. The instrument being set on a suitable surface, and at a convenient height so that the eyes can be directly over it, the caps and set-screws are loosened, so that the runner is free to move and the circle to revolve around the disk. The operator then assumes the position shown in Fig. 2, and exercises just force enough to hold the entire apparatus steady. His right hand grasps the edge of the outer ring, moving it either to or from

him, as may be necessary to bring the recorded figures in line. To assist in this, the runner is used.

It is impossible to give here a full description of the process, but it seems to be little more than finding and aligning certain figures in the two concentric tables. It is claimed by its inventor, Mr. Walter Hart of this city, that with it the simplest as well as the most complicated problems in multiplication, division, proportion, compound proportion, common divisor, common multiple, interest, involution, evolution, compound percentages, averaging of accounts, etc., can be readily solved. He has prepared for distribution a pamphlet giving a full description of the device, and of the method of using it.

OIL AND IRON IN NEW ZEALAND.

THE New Zealand Government have recently published a report upon the petroleum-deposits of the Taranaki district, which apparently have a great future before them. The oil comes to the surface in many places near New Plymouth, besides impregnating the surrounding country to such an extent that farmers have had to abandon many wells, on account of the petroleum gushing into them with the water. To ascertain whether there was a probability of these oil-deposits proving a mercantile success, the government of New Zealand deputed Mr. Gordon, inspecting engineer of the Mines Department, to visit the locality. Mr. Gordon made a careful survey of the country, and in his lengthy report he affirms that "petroleum exists over a large area, and that it is only a question of boring to the requisite depth to get at the source." According to *Engineering*, these deposits have a twofold advantage: if successfully developed, they not only have at their disposal the Australasian market, now dependent on America for oil, but they would further provide with fuel the local iron industry, at present resting upon limited supplies of coal and charcoal.

Along the shores of the Taranaki district stretch the famous iron-sand beaches of New Zealand, — beaches composed almost entirely of pulverized iron ore. Countless millions of tons of this material lie along the western coasts of the North Island of New Zealand. The ore produces splendid iron, but is somewhat refractory. This would be a trifle, however, if an abundant supply of cheap fuel were available for smelting purposes. This seems to be now forthcoming in the shape of petroleum. For some time past oil has been largely used for smelting in America, and there is no reason why it should not be successfully adopted in New Zealand; the Taranaki oil having plenty of body, and being admirably adapted for fuel purposes. It may be noted, that, while the oil-deposits of America and Russia are several hundred miles inland, those of New Zealand are actually on the coast; so close, indeed, that the beach at New Plymouth is pitted with petroleum oozings. What is now wanted is some trial drills to test the quantity and character of the oil-supply. A few drills in the vicinity of New Plymouth ought to bring to the surface not only enough oil to provide the locality with smelting fuel, but also sufficient for several refineries.

It is curious, that, while millions are invested by the public of this country in purely speculative gold-mines, hardly any funds are devoted to sinking wells for petroleum in Burmah, Canada, and New Zealand. In America, hundreds of times over, a single well has proved as remunerative as a gold-mine; yet, although petroleum can be easily enough turned into gold, such is the demand for it, English investors have hitherto ignored petroleum undertakings. Presently they will rush into it, just as shippers have rushed into the oil-steamer business, building sixty tank-vessels in less than five years, after a prolonged period of similar indifference.

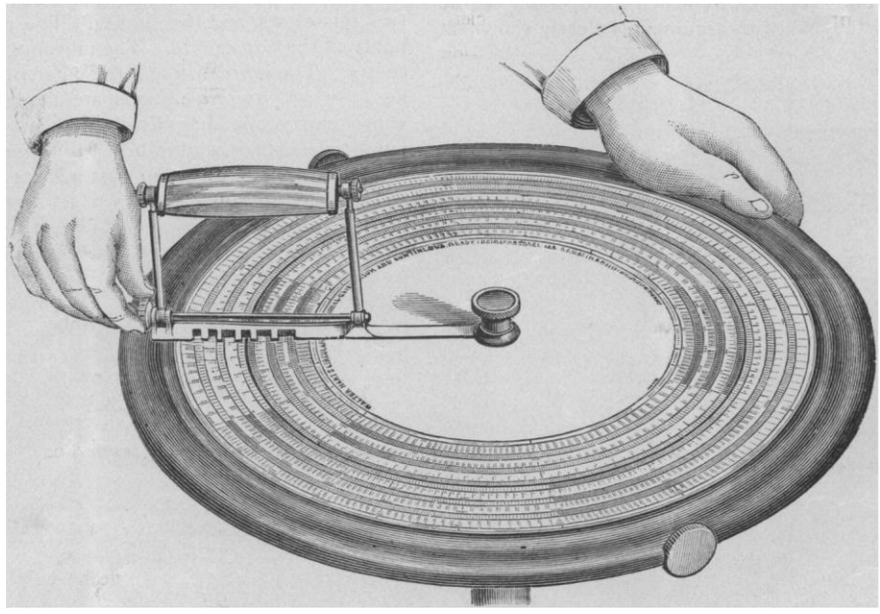


FIG. 3. — THE PROPORTIOR.

THE ORIGIN OF PETROLEUM.[1]

THE enormous consumption of petroleum and natural gas frequently raises the question as to the probability of the proximate exhaustion of the supply; and, without doubt, many fear to adopt the use of oil, from a feeling that if such use once becomes general, the demand will exceed the production, the price will rise indefinitely, and old methods of illumination and old forms of fuel will have to be reverted to. From this point of view, it is most interesting to inquire what are the probabilities of a continuous supply; and such an investigation leads at once to the question, "What is the origin of petroleum?" In the year 1877, Professor Mendeleeff undertook to answer this question; and as his theory appears to be very little known, and has never been fully set forth in the English language, I trust you will forgive me for laying a matter so interesting before you. Dr. Mendeleeff commences his essay by the statement that most persons assume, without any special reason, — excepting, perhaps, its chemical composition, — that naphtha, like coal, has a vegetable origin. He combats this hypothesis, and points out, in the first place, that naphtha must have been formed in the depths of the earth. It could not have been produced on the surface, because it would have evaporated; nor over a sea-bottom, because it would have floated up and been dissipated by the same means. In the next place, he shows that naphtha must have been formed beneath the very site on which it is found; that it could not have come from a distance, like so many other geological deposits, and for the reasons given above, namely, that it could not be water-borne, and could not have flowed along

[1] Extracted from Mr. Anderson's presidential address to Section G (Mechanical Science) of the British Association.

the surface; while in the superficial sands in which it is generally found no one has ever discovered the presence of organized matter in sufficiently large masses to have served as a source for the enormous quantity of oil and gas yielded in some districts; and hence it is most probable that it has risen from much greater depths under the influence of its own gaseous pressure, or floated up upon the surface of water, with which it is so frequently associated.

The oil-bearing strata in Europe belong chiefly to the tertiary or later geological epochs; so that it is conceivable that in these strata, or in those immediately below them, carboniferous deposits may exist, and may be the sources of the oil. But in America and in Canada the oil-bearing sands are found in the Devonian and Silurian formations, which are either destitute of organic remains or contain them in insignificant quantities. Yet, if the immense masses of hydrocarbons have been produced by chemical changes in carboniferous beds, equally large masses of solid carboniferous remains must still exist; but of this there is absolutely no evidence while cases occur in Pennsylvania where oil is obtained from the Devonian rocks underlying compact clay-beds, on which rest coal-bearing strata. Had the oil been derived from the coal, it certainly would not have made its way downwards; much less would it have penetrated an impermeable stratum of clay. The conclusion arrived at is, that it is impossible to ascribe the formation of naphtha to chemical changes produced by heat and pressure in ancient organized remains.

One of the first indices to the solution of the question lies in the situation of the oil-bearing regions. They always occur in the neighborhood of, and run parallel to, mountain-ranges: as, for example, in Pennsylvania, along the Alleghanies; in Russia, along the Caucasus. The crests of the ranges, formed originally of horizontal strata which had been forced up by internal pressure, must have been cracked and dislocated, the fissures widening outwards, while similar cracks must have been formed at the bases of the ranges; but the fissures would widen downwards, and would form channels and cavities, into which naphtha, formed in the depths to which the fissures descended, would rise and manifest itself, especially in localities where the surface had been sufficiently lowered by denudation or otherwise.

It is in the lowest depths of these fissures that we must seek the laboratories in which the oil is formed; and, once produced, it must inevitably rise to the surface, whether forced up by its own pent-up gases or vapors, or floated up by associated water. In some instances the oil penetrating or soaking through the surface layers loses its more volatile constituents by evaporation, and in consequence deposits of pitch, of carboniferous shales, and asphalt, take place; in other cases, the oil, impregnating sands at a lower level, is often found under great pressure, and associated with forms of itself in a permanently gaseous state. This oil may be distributed widely, according to the nature of the formations or the disturbances to which they have been subjected; but the presence of petroleum is not in any way connected with the geological age of the oil-bearing strata, it is simply the result of physical condition and of surface structure.

According to the views of Laplace, the planetary system has been formed from incandescent matter torn from the solar equatorial regions. In the first instance, this matter formed a ring analogous to those which we now see surrounding Saturn, and consisted of all kinds of substances at a high temperature; and from this mass a sphere of vapors, of larger diameter than the earth now has, was gradually separated. The various vapors and gases which, diffused through each other, formed at first an atmosphere round an imaginary centre, gradually assumed the form of a liquid globe, and exerted pressures incomparably higher than those which we experience now at the base of our present atmosphere. According to Dalton's laws, gases, when diffused through each other, behave as if they were separate: hence the lighter gases would preponderate in the outer regions of the vaporous globe, while the heavier ones would accumulate to a larger extent at the central portion; and at the same time the gases circulating from the centre to the circumference would expand, perform work, would cool in consequence, and at some period would assume the liquid or even the solid state, just as we find the vapor of water diffused through our present atmosphere does now. That which is true of changes of physical condition, Henri St. Claire Deville, in his brilliant theory of dissociation, has shown to be equally true with respect to chemical changes; and the cooling of the vapors forming the earth while in its gaseous condition was necessarily accompanied by chemical combinations, which took place chiefly on the outer surface, where oxides of the metals were formed; and, as these are generally less volatile than the metals themselves, they were precipitated on to what there then was of liquid or solid of the earth, in the form of metallic rain or snow, and were again probably decomposed, in part at least, to their vaporous condition. The necessary consequence of this action is that the inner regions of the earth must consist of substances the vapors of which have high specific densities and high molecular weights, — that is to say, composed of elements having high atomic weights, — and that the heavier elementary substances would collect near the centre, while the lighter ones would be found nearer the surface. Our knowledge of the earth's crust extends but to an insignificant distance; yet, as far as we do know it, we find that the arrangement above indicated prevails. Hydrogen, carbon, nitrogen, oxygen, sodium, magnesium, aluminium, silicon, phosphorus, sulphur, chlorine, potassium, calcium, — substances whose atomic weights range from 1 to 40, — became condensed, entered into every conceivable combination with each other, and produced substances the specific gravity of which averages about 2½, never exceeds 4, and are found near the immediate surface of the globe.

But the mean specific gravity of the earth as determined by Maskelyne, Cavendish, and others, certainly exceeds 5, and consequently the inner portion of our globe must be composed of substances heavier than those existing on the surface; and such substances are only to be found among the elements with high atomic weights. The question arises, "What elements of this character are we likely to find in the depths of the earth?" In the first place, since gases diffuse through each other, a certain proportion of the elements of high atomic weight will also be found on the surface of the earth. Second, the elements forming the bulk of the earth must be found in the atmosphere of the sun — if, indeed, the earth once formed part of its atmosphere. Of all the elements, iron, with a specific gravity exceeding 7, and with an atomic weight of 56, corresponds best with these requirements, for it is found in abundance on the surface of the earth; and the spectroscope has revealed the very marked presence of iron in the sun, where it must be partly in the fluid and partly in the gaseous state, and consequently iron in large masses must exist in the earth: so that the mean specific gravity of our planet may well be 5, the value of which has been determined by independent means.

It is not easy, however, to define in what condition the mass of iron which exists in the heart of the earth is likely to be. Iron is capable of forming a vast number of combinations, depending on the relative proportion of the various elements present. Thus, in the blast-furnace, oxygen, carbon, nitrogen, calcium, silicon, and iron are associated, and produce under the action of heat, besides various gases, a carburet of iron and slag, the latter containing chiefly silicon, calcium, and oxygen; that is to say, substances similar to those which form the bulk of the surface of the earth. But these same elements, if there be an excess of oxygen, will not yield any carburet of iron; and the same result will follow if there be a deficiency of silicon and calcium, because of the large proportion of oxygen which they appropriate. In the same way, during the cooling of the earth, if oxygen, carbon, and iron were associated, and if the carbon were in excess of the oxygen, the greater part of the carbon would escape in the gaseous state, while the remaining part would unite with the iron. It is certain that in the heart of the earth there must have been a deficiency of oxygen, because of its low specific gravity; and the argument is supported by the fact that free oxygen and its compounds, with the lighter elements, abound on the surface. Further, it must be presumed that much of the iron existing at great depths must be covered over and protected from oxygen by a coating of slag; so that, taking all these considerations into account, it is reasonable to conclude that deep down in the earth there exist large masses of iron, in part at least in the metallic state, or combined with carbon.

The above views receive considerable confirmation from the composition of meteoric matter; for it also forms a portion of the solar

system, and originated, like the earth, from out of the solar atmosphere. Meteorites are most probably fragments of planets, and a large proportion of them include iron in their composition, often as carbides, in the same form as ordinary cast iron; that is to say, a part of the carbon is free, and a part is in chemical union with the iron. It has been shown, besides, that all basalts contain iron, and basalts are nothing more than lavas forced by volcanic eruptions from the heart of the earth to its surface. The same causes may have led to the existence of combinations of carbon with other metals.

The process of the formation of petroleum seems to be the following: It is generally admitted that the crust of the earth is very thin in comparison with the diameter of the latter, and that this crust encloses soft or fluid substances, among which the carbides of iron and of other metals find a place. When, in consequence of cooling or some other cause, a fissure takes place through which a mountain-range is protruded, the crust of the earth is bent, and at the foot of the hills fissures are formed; or, at any rate, the continuity of the rocky layers is disturbed, and they are rendered more or less porous, so that surface waters are able to make their way deep into the bowels of the earth, and to reach occasionally the heated deposits of metallic carbides, which may exist either in a separated condition or blended with other matter. Under such circumstances, it is easy to see what must take place. Iron, or whatever other metal may be present, forms an oxide with the oxygen of the water. Hydrogen is either set free or combined with the carbon which was associated with the metal, and becomes a volatile substance; that is, naphtha. The water which had penetrated down to the incandescent mass was changed into steam, a portion of which found its way through the porous substances with which the fissures were filled, and carried with it the vapors of the newly formed hydrocarbons; and this mixture of vapors was condensed wholly or in part as soon as it reached the cooler strata. The chemical composition of the hydrocarbons produced will depend upon the conditions of temperature and pressure under which they are formed. It is obvious that these may vary between very wide limits; and hence it is that mineral oils, mineral pitch, ozokerite, and similar products differ so greatly from each other in the relative proportions of hydrogen and carbon. I may mention that artificial petroleum has been frequently prepared by a process analogous to that described above.

Such is the theory of the distinguished philosopher, who has framed it not alone upon his wide chemical knowledge, but also upon the practical experience derived from visiting officially the principal oil-producing districts of Europe and America, from discussing the subject with able men deeply interested in the oil industry, and from collecting all the available literature on the subject. It is needless to remark that Dr. Mendeleeff's views are not shared by every competent authority; nevertheless the remarkable permanence of oil-wells, the apparently inexhaustible evolution of hydrocarbon gases in certain regions, almost forces one to believe that the hydrocarbon products must be forming as fast as they are consumed, that there is little danger of the demand ever exceeding the supply, and that there is every prospect of oil being found in almost every portion of the surface of the earth, especially in the vicinity of great geological disturbances. Improved methods of boring wells will enable greater depths to be reached; and it should be remembered, that, apart from the cost of sinking a deep well, there is no extra expense in working at great depths, because the oil generally rises to the surface or near it. The extraordinary pressures, amounting to three hundred pounds per square inch, which have been measured in some wells, seem to me to yield conclusive evidence of the impermeability of the strata from under which the oil has been forced up, and tend to confirm the view that it must have been formed in regions far below any which could have contained organic remains.

AT Reykjavik a society has just been established, under the presidentship of Professor B. Grondal, called the Icelandic Naturalists' Society, the chief aim of which is to found a museum of natural history for Iceland, to be the property of the country. For this purpose it is not only intended to collect specimens of the fauna, flora, and mineral deposits of Iceland, but also to obtain by exchange, or in any other convenient manner, specimens from abroad.

OPEN-AIR TRAVEL AS A CURER AND PREVENTER OF CONSUMPTION, AS SEEN IN THE HISTORY OF A NEW ENGLAND FAMILY.[1]

"For my own part, I intend to hunt twice a week during my stay with Sir Roger; and I shall prescribe the moderate use of this exercise to all my country friends as the best kind of physic for mending a bad and preserving a good one." — *Sir Roger de Coverley*, chapter xiii. p. 101, Goldschmidt, Edinburgh, 1889.

IT is a curious coincidence, that, at the same meeting of the Climatological Association, the president should give you some information gleaned from my recorded cases as to the connection of pleurisy with phthisis, and I should present the history of my father,[2] cured, as I believe, of severe phthisical symptoms by a journey in an open chaise, and by persistent daily walking of from five to six miles during the rest of his life. In connection with this, I shall endeavor to show, that, by the same persistent open-air treatment of his children during their periods of growth, he was able to prevent the occurrence of the same disease in a large number of his descendants, who, in consequence of himself and his wife being tuberculous, and also first-cousins, must have been very strongly predisposed to it.[3]

I have a record of this journey as kept by my father in 1808, when he was thirty-five years of age. I found it recently, tied up in a bundle of old papers which had been resting quietly hidden for over half a century. It is a very compact, precisely written statement of that journey, showing, indirectly at least, its benign effects upon him.

It is eminently suggestive to me of the proper treatment of certain cases of phthisis; and, in the hope that it will be suggestive to others also, I now lay it before this society. To some sensitive minds it may seem to be of too private and personal a character to be placed thus freely before any public assembly. I have no such feeling when questions of human health and happiness are involved.

In 1808 my father was undoubtedly threatened with consumption. He had cough, hemoptysis, anorexia, diarrhœa, and general malaise, with fever and great debility. On Aug. 29 of that year, when thus ill, he started, with a friend as his companion and driver, in an open, one-horse chaise for a tour through New England. At that time it will be recollected that there were no cars, and travel was had in one's own carriage or in public coaches holding nine persons. These were driven over turnpikes or private roads. There were hotels, more or less comfortable, at which travellers could sleep and get food, in every town. This record lets us more or less distinctly into the feelings, physical and mental, of every day of the month during which the journey lasted. A glance at the map[4] will show that the travellers went from Salem, Mass., down into Rhode Island, thence by way of Connecticut up through the hills of western Massachusetts to Albany and Troy, and back through Massachusetts to New Hampshire, Vermont, and Maine, and then to the home from which he started. During the trip he travelled 748 miles, passed through 113 towns and cities, and the time spent in this daily open-air exercise was thirty days. During that time he went through all stages of feeling of mental discouragement and of physical weakness up to a real enjoyment of life.

Allow me to refer briefly to these changes. Starting from Sa-

[1] Read before the American Climatological Association, June, 1889, by Henry L. Bowditch, M.D., of Boston, Mass.

[2] Capt. Nathaniel Bowditch, the father of American mathematics.

[3] I am well aware, that, since the brilliant discovery by Koch of the bacillus tuberculosis, some writers deny that phthisis can be inherited. But surely this opinion I cannot think true. All my medical experience is directly against it. Moreover, we all admit that a certain deterioration of the vital power of the whole, or an abrasion of a part, of the body, is necessary for the life and propagation of the bacillus and consequent production of tubercular phthisis. Hence, as far as active out-of-door life tends to the production of perfect health in a person or a family, it would seem, *a priori*, that the course pursued by my father, which undoubtedly was of such infinite service in his own case toward the cure of phthisis, must have been of great use to his children as a preventive, by making them all robust from their earliest years. By so doing he opposed any tendency to poor constitutions, impressed on them from their births; which tendencies, if they had not been counteracted from early life, would, I believe, have made his descendants easy recipients of phthisis.

[4] A large map was shown at the meeting, marked by circles on the towns where the nights were passed. These circles were entirely black at first, indicating great depression of mind and body, and they became gradually lighter as the patient got better. Those over the last half of the journey were not only free from any shade, but were surrounded by a red border, indicating the comfortable feeling of returning health.

lem (black) with the prominent signs of phthisis, he was so much exhausted, and had hemoptysis after a drive of twenty-five miles to Milton, that the landlord of the hotel advised his friend to take him home to die, as he could not possibly drive to Taunton the next day, as proposed. I derive this last statement, not from the journal, but from family tradition. The travellers were both of them plucky, and not only made that next day's journey, but the sick man felt somewhat better at evening, and notes in the latter part of his record the condition of the country before arriving at Taunton. His fifty miles since leaving Salem had evidently done no harm, but rather good. Anorexia had gone, as he "dined" (with relish, apparently, because he could get nothing else) "on bacon and eggs." Arrived at New Bedford next day, he feels able to visit a friend. He examines a factory. He makes remarks on the inhabitants he met and their employments. Though still having some fever, he feels so much better that much darkness is removed from the circle. Still more refreshed after a night's sleep, and having still less fever, he visits a coal-mine recently discovered in the vicinity.

From this time there is almost steady improvement. He visits Newport (109 miles from Salem), admires the harbor, but notices its lack of shipping (to which in Salem, with its fleets of ships and their long, wealth-bringing East India voyages, he had been long accustomed). At Providence (141 miles from Salem) he finds friends, and has pleasant meeting with them. Nothing is said of illness. On the contrary, he has his "Rosinante harnessed" the next day, with the intention of driving out of his intended route, in order to visit the cotton-factories at Pawtucket Falls. Arriving at Hartford (195 miles from Salem), he is altogether better, finds good fare and a fine hotel. He meets there the judges in their circuit, and has pleasant and profitable conversation with them at the hotel at which they were stopping for the night.

At New Haven (256 miles from Salem, and twelve days of open-air travel) he calls on President Dwight of Yale College, and regrets that the eminent Professor Silliman is absent, He visits the library, and finds it wanting in most of the modern English, French, and German scientific works he had been so long acquainted with, and had studied in Salem. At New Haven he makes, for the last time, any allusion to his health, in the following words: "I have a little pain in my breast, but my appetite and general health are good."

After this date, till he arrived home, his record seems like that of a common traveller. He makes no complaints, but describes brightly the places, friends, and others met, exactly as if he were well, and travelling for pleasure only.

At Albany he makes an especial and extra journey to Troy with a party of transiently met friends, leaving his chaise for nearly two days in the former city. He found the trip "very pleasant." On return to Albany from Troy, he had driven 432 miles in nineteen days.

Starting for home, he appears delighted while travelling through a "picturesque" country, and meeting at the various hotels intelligent company whose society he was able generally to enjoy.[1] He visits the village of Canaan, and describes in detail what he saw of the Shakers, and heard an extraordinary sermon delivered *at* him, among others, as one of the "outside mankind." I forbear quoting from it. His appetite was becoming ravenous. They would not give him at one tavern, as he says, "half as much as I wanted for my dinner." Finally he arrived home at Salem, so the record states, "in much better health than he had when starting."

His subsequent course in regard to himself and to his children induces me to believe that the journey, though benefiting him immensely, had not wholly cured him; but it had proved to him the absolute need he had of regular, daily, physical, open-air exercise. Afterward, under walks of one and a half to two miles, taken three times daily during thirty years of life, all pulmonary troubles disappeared. He died in 1838, from carcinoma of the stomach, one lung presenting evidences of an ancient cicatrix at its apex, both being otherwise normal. He was sixty-five years old; i.e., thirty years after the journey.

[1] This was not always the case, however, for at one town he met one gentleman, "a member of Congress," who was apparently stupid enough. "He scarcely spoke a syllable during the evening."

Having thus experienced in his own case the vast benefits resulting from constant, regular exercise out of doors, he apparently determined that his children should be early instructed in the same course. As soon as we were old enough, he required of us daily morning walks down to a certain well-known divine's meeting-house, about three-quarters of a mile or a mile from our home. I remember them very well for the tricks played with my brothers on our way down, and for sundry twinges of conscience, felt even at this moment, at the thought that we sometimes decided that the sight of the "weathercock on Dr. Bentley's steeple," though seen more than a quarter of a mile from our proper destination, was near enough to our father's directions.

If any of us, while attending school, were observed to be drooping, or made the least pretence even to being not "exactly well," he took us from school, and very often sent us to the country to have farm-life and out-of-door "play to our hearts' content." Once he told me to go and play, and to "stay away from study as long as you choose." In fact, he believed heartily in the old Roman maxim of "a healthy mind in a healthy body." In consequence of this early instruction, all of his descendants have become thoroughly impressed with the advantages of daily walking, of summer vacations in the country, and of camping out, etc., among the mountains. These habits have been transmitted, I think, to his grandchildren in a stronger form, if possible, than he himself had them.

You will readily agree with me that such habits are among the surest guaranties against the prevalence of phthisis in a family. Before detailing the actual result of these habits upon our family, I must state the prospective chances of our escape from the malady. My father married his cousin, who, after long invalidism, died of chronic phthisis in 1834. Certainly a consanguineous union of two consumptives foreboded nothing but evil. They had eight children (born respectively in the years 1805, 1806, 1808, 1809, 1813, 1816, 1819, 1823). Two (born 1809 and 1813; i.e., one and five years after the journey) died, one at eleven, and the other at birth. All the others either are now alive, or they arrived at adult life and married, and have had children and grandchildren, but not a trace of phthisis has appeared in any of these ninety-three[1] persons.

Now, I ask the consideration of this question: To what cause can we attribute this extraordinary immunity from the disease which is generally regarded as showing the influence of heredity and of consanguineous unions more, perhaps, than most other complaints?

If any one can see any other explanation than the influence of this original journey upon the health of one of the great-great-grandparents, conjoined with his wise management of his own health subsequently, and his fastening upon his descendants, even to the present day, the virtues of open-air life, I hope he will frankly say so. Truth should be forever our motto; and the man who will convince me of the error of any scientific, or apparently scientific, statement I may utter, and which, if not corrected, may lead others astray, I regard not as an opponent, but as my foremost friend.

I submit these facts and thoughts for candid, mature, and practical consideration and use in the treatment all are called to make of this terrible scourge of all parts of this Union. For my own part, I fully believe that many patients now die from want of this open-air treatment. For years I have directed every phthisical patient to walk daily from three to six miles; never to stay all day at home unless a violent storm be raging. When they are in doubt about going out, owing to "bad weather," I direct them to "solve the doubt, not by staying in the house, but by going out."

A cloudy day, or a mild rain, or the coldest weather, should not deter them. If the weather be very cold, let them put on respirators before leaving the house, and be thoroughly wrapped in proper clothing for the season. I direct them never to stand still and gossip with friends in the open street, as by so doing they are much more liable to get a chill than while walking. Hence, summer and winter alike, my patients usually get plenty of fresh air, uncontami-

[1] The number of their descendants amounts now (1889) to 8 children, 31 grandchildren, 50 great-grandchildren, 4 great-great-grandchildren: total 93. It may be noted, that, of the two who were born in 1809 and 1813, one died when eleven years old (1820), and the other at birth (1813); while the writer and reader of this paper was born twenty days before the journey began.

nated, in a great part at least, by the previous breathing of it by themselves or by other occupants of the house. This course, I believe, might be pursued in any part of our common country. I am certain that I know of patients who have become well, and able to attend to the business of life, under this course. May we not also at times send our patients over short distances in open vehicles, instead of thousands of miles off in ill-ventilated cars to an entirely different climate? Have any of us ever sufficiently tried this open-air journeying at home, so to speak; that is, in the region of the country where the patient lives, wherever that may be?

Certainly this proposed course has at least two sound physiological principles in its favor: viz., a gentle exercise, for many hours in each day, of the whole frame; and an almost perpetual change of air drawn in with each respiratory act, as occurs while driving in a carriage open at the front, and in walking. I have no objection to drugs, properly chosen, and I almost always administer them; but if the choice were given me to stay in the house and use medicines, or to live constantly in the open air without them, I should infinitely prefer the latter course in case of my being threatened with pulmonary consumption.

HEALTH MATTERS.

Typhoid-Fever should be reported to the Health-Officer.

TYPHOID-FEVER is a disease which the State Board of Health of Michigan has declared to be "dangerous to the public health," and as such it comes under the law requiring physicians to report to the health-officials. Any physician who shall neglect to immediately give such notice "shall forfeit for each such offence a sum not less than fifty nor more than one hundred dollars." After Oct. 1, any householder who shall refuse or wilfully neglect immediately to give such notice shall be deemed guilty of a misdemeanor, and is liable to a fine of one hundred dollars, or, in default of payment thereof, may be punished by imprisonment in the county jail not exceeding ninety days.

It seems important that the people generally shall understand this new law, which applies to scarlet-fever, diphtheria, small-pox, and all such dangerous diseases, as well as to typhoid-fever; but at this time of the year typhoid-fever is usually most prevalent, and it is especially dangerous in times of drought: therefore the safety of the people may now be greatly promoted by having every case of typhoid-fever reported to the health-officer, who is by law (Section 1, Act 137, Laws of 1883) required to promptly attend to the restriction of every such disease. A new law, which takes effect Oct. 1, makes it a misdemeanor, punishable by fine or imprisonment, for the health-officer knowingly to violate that section of the law, or for any person knowingly to violate the orders of the health-officer made in accordance with that section. But the actual penalties which are incurred by the violation of these laws are the death penalties to many of the people, about one thousand being lost in Michigan in each year from typhoid-fever. The saving of a large proportion of these lives is the real reason for the effort, in which it is hoped all the people will join, for the restriction of typhoid-fever and other dangerous diseases.

HOW MUCH SHOULD A CITY PAY ITS HEALTH-OFFICER? — The Michigan State Board of Health has recently published a paper by its secretary, Dr. H. B. Baker, in which he asks the question how much the average city or village can afford to pay its health-officer. He answers this question in this way: "Statistics which cannot be questioned prove, that, in those localities in Michigan where the recommendations of the State Board of Health are carried out, about eighty per cent of the deaths from diphtheria and scarlet-fever are prevented by the thorough isolation of all infected persons, and the thorough disinfection of all infected persons, things, and places. Statisticians usually value a person in the prime of life as worth to the community about one thousand dollars." Dr. Baker thinks that in a village of fifteen hundred inhabitants a health-officer can easily save the lives of two children and one grown person in each year, and he concludes that such a village can well afford to pay its health-officer two thousand dollars for the prevention and restriction of scarlet-fever, diphtheria, and typhoid-fever — and make money by the transaction.

INGENUITY OF CRIMINALS. — The *Medical Press and Circular* finds in an Indian contemporary some curious instances of misapplied ingenuity on the part of certain habitual criminals in that country. The discovery on a prisoner of a heavy leaden bullet about three-quarters of an inch in diameter led to an inquiry into the object to which it was applied. It was ascertained that it served to bring about the formation of a pouch-like recess at the base of the epiglottis. The ball is allowed to slide down to the desired position, and it is retained there for about half an hour at a time. This operation is repeated many times daily until a pouch the desired size results, in which criminals contrive to secrete jewels, money, etc., in such a way as to defy the most careful search, and without interfering in any way with speech or respiration. Upwards of twenty prisoners at Calcutta were found to be provided with this pouch formation. The resources of the professional malingerer are exceedingly varied, and testify to no small amount of cunning. The taking of internal irritants is very common, but would-be inpatients very frequently overshoot the mark, and render recovery impossible. Castor-oil seeds, croton beans, and sundry other agents are employed with this object in view, and the medical officers of Indian prisons have to be continually on the lookout for artificially induced diseases, which baffle diagnosis and resist treatment. Army surgeons are not altogether unfamiliar with these tricks, but the British soldier is a mere child in such matters compared with the artful Hindoos.

REGULATION OF BREATHING IN SEASICKNESS. — Dr. Ivan A. Mitropolsky of Moscow recommends, on the ground of his own experience, the following simple method for preventing or aborting all symptoms of seasickness. According to *The Medical Record*, as soon as giddiness, nausea, etc., appear, the author shuts his eyes, and begins to make deep and slow inspirations and expirations. In a few moments (sometimes after three or four respiratory cycles) the symptoms disappear to yield to a comfortable subjective sensation. On their re-appearance, the same procedure is repeated again and again. If the recurrence be rather frequent, it is better to perform the procedure in a recumbent posture (with closed eyes). Since the time the author has begun to practise the method, he never yet suffered from vomiting when on board. In referring to this case in the London *Medical Recorder*, Dr. Idelson says that Dr. Mitropolsky seems to think that the means proposed by him is novel. Meanwhile, in the *British Medical Journal*, March 24, 1888, p. 676, he will find a very interesting note by Dr. J. J. Leiser, in which the writer says (1) that seasickness is caused by irregular and imperfect respiration, leading necessarily to an inadequate aëration of the patient's blood, which consequently becomes poisonous to his brain, and gives rise to sympathetic sickness; (2) that a system of regular, free breathing prevents sickness, or rapidly relieves it; and (3) that his experiments were successfully repeated by Drs. G. C. Stockman and C. W. C. Prentice, who, having selected ten suffering passengers, each seated himself with five of them, and "timed the breathing in the following manner: they (the doctors) raised the hand from the knee, indicating an inspiration, and down again for an expiration, thus timing the respirations to exactly twenty per minute. At the expiration of one hour the active symptoms in each case had entirely subsided." By this time the doctors had thoroughly educated their patients in the *modus operandi* of the cure. The cases continued to be permanent "cures" during the remainder of the voyage from Queenstown to the United States. The writers conclude by asserting that "the cure is infallible in all cases that persist in carrying it out."

HOT-AIR INHALATIONS IN CONSUMPTION. — From experiments in a number of cases, Dr. E. L. Trudeau of Saranac Lake, N.Y., concludes that (1) the therapeutic value of hot-air inhalations in phthisis is doubtful; and (2) the evidence obtained by the bacteriological study of the cases presented does not confirm the assumption that inhalations of heated air can either prevent the growth of the tubercle bacillus in the lungs of living individuals or diminish the virulence of this microbe when it has gained access to them.

THE BREEDING OF SINNERS. — The French Government hopes, apparently, by promoting marriages between male and female convicts, to bring back these stray sheep into the fold of morality and

good conduct. Arrangements have accordingly been made, says the *Hospital Gazette*, to facilitate these unions; but physiologists and pathologists must feel sundry qualms as to the expediency of such a course. The physical and moral degradation of many of these social waifs is distinctly hereditary; and a careful moral training (which is not provided for) would, at the most, only modify the tendencies which have brought them within the clutches of the criminal law. The son of a poet is not of necessity a poet, but the offspring of a bawd or an assassin is extremely likely to develop the same proclivities. If even one of the parties to the transaction were worthy of respect, some regeneration might be hoped for; but the association of two hopelessly abandoned bodies and souls is not calculated to improve matters in any respect whatever.

A CENTENARIAN SURGEON. — The *Patria* of Buenos Ayres affirms that there is now in Bolivia a surgeon, Luca Silva by name, whose age is not less than one hundred and twenty-nine years. He was born in Cochabamba in 1760, and devoted himself, after graduating in medicine, to the practice of surgery. He rendered important service to his country, when, after the famous manifesto of June 16, 1809, she entered on her struggle for independence. His treatment of the wounded, particularly his operations on the field of battle, won him high distinction. He also earned signal honor in the combatant ranks. This parallels the case of Dr. Holyoke of Salem, Mass., who practised his profession for upward of eighty years, his visit-books being still extant showing the record from beginning to end.

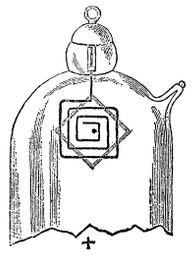
BACILLI ON A BALD HEAD. — Dr. Saymonne claims to have isolated a bacillus, called by him "bacillus crinivorax," which is the cause of alopecia. It is, he says, found only on the scalp of man, other hirsute parts of the body and also the fur of animals being free from it. The bacilli invade the hair-follicles, and make the hair very brittle, so that they break off to the skin. Then the roots themselves are attacked. If the microbes can be destroyed early in the disease, the vitality of the hairs may be preserved; but after the follicles are invaded, and all their structures injured, the baldness is incurable. The following is Dr. Saymonne's remedy to prevent baldness: Ten parts crude cod-liver oil, ten parts of the expressed juice of onions, and five parts of mucilage or the yolk of an egg, are thoroughly shaken together, and the mixture applied to the scalp, and well rubbed in, once a week. This, he asserts, will certainly bring back the hair if the roots are not already destroyed; but the application of the remedy, as *The Medical Record* well observes, must be very distressing to the patient's friends and neighbors.

ELECTRICAL NEWS.

ELECTRIC LIGHTING FROM PRIMARY BATTERIES. — The chromic chloride primary batteries of Commandant Renard seem to be enjoying some success abroad. Thirty-six cells of this battery are deemed sufficient to run a 300-candle-power arc-lamp, and it is claimed that a 900-candle-power arc-lamp can be run from 42 of these cells. The cost per candle-power hour is estimated to be about one-fifth of a penny. A number of primary batteries have been introduced in this country for the purpose of electric lighting, and much money has been spent in patenting and placing them upon the market. As far as we know, they have never realized an approach to commercial success.

ST. LOUIS ELECTRICAL EXPOSITION. — This exposition is being held at St. Louis, and is certainly a very attractive feature in that city just now. A number of prominent exhibiters are represented. Among the miscellaneous exhibits are those of the Writing Telegraph Company of New York, the Electric Date and Time Stamp Company of St. Louis, the Graphophone-Phonograph Company of New York, and the American Waltham Watch Company of Boston, Mass., to say nothing of other companies manufacturing miscellaneous devices. The parent electric manufacturing companies are well represented, both as to *personnel* and machinery. Besides apparatus of a strictly electrical character, one finds leather belting, steam-engines, feed-water heaters, water-wheels, wire, etc., which all are day by day assuming a closer relation to the electric-lighting industry. One of the most interesting exhibits is the electric welding apparatus shown by the Thomson Electric Welding Company of Boston. It is not generally known just how complete and satisfactory this process is, and the company are taking advantage of the splendid opportunity now offered them in St. Louis to show and do all varieties of welding-work in the exposition building. Another device that seems to be appreciated by ladies and practical-minded husbands is the electric heater of the Burton Electric Heater Company of Richmond, Va. This heater is in actual use, cooking beefsteak, eggs, etc.; the inventor taking this opportunity of showing just what electricity is destined to do in the way of culinary and general heating attainment. Almost every thing and every body electrical are represented, notwithstanding which fact the exposition cannot be said to equal that in Chicago on the occasion of the annual meeting of the National Electric Light Association last February.

VOLATILIZATION OF METALS. — A correspondent of the *Revue Internationale de l'Electricité* writes, "We have received from M. Gaston Seguy, who is not only a clever glass-blower, but also an intelligent observer, two samples of tubes in which the volatilization of metals in a vacuum by the passing of the electric current has given rise to some curious phenomena, which we are unable to explain satisfactorily. We therefore confine ourselves to submitting to our readers the result of these experiments, hoping that perhaps one of them will be able to indicate on what theory we can



base our facts. A glass tube three centimetres in diameter is closed at the two extremities, and to each end is soldered an electrode of platinum or copper of the form shown in the adjoining figure. Through a nipple on the side of the tube a vacuum equal to that of the Geissler tubes is produced by means of a mercury-pump; then the current of a powerful induction-coil (three-tenths of a metre spark at least) is passed through. The metal is then volatilized at the negative pole, and is deposited on the sides of the glass, producing a black discoloration for platinum, and yellow for copper. The metallization of the sides of the tube is more rapid in proportion as the diameter is smaller; but in any case it produces this curious phenomenon, to which we wish to call attention: it does not take place at all on either side on that part of the tube placed directly opposite the plane of the electrode, as we can easily see by placing the tube before a sheet of white paper. The reservation thus obtained exactly reproduces the external form of the electrode; but what is still more curious is, that the angles of this outline do not correspond to the angles of the electrode, but come opposite the straight lines, as shown in the accompanying figure. These are phenomena similar to those observed by Crookes, Jamin, and Goltein; and we think, that, in order to facilitate an explanation of them, it is better not to pass them by in silence, but, on the contrary, to note them with all their peculiarities every time we observe them."

NOTES AND NEWS.

ON Friday evening, Sept. 6, the Nevada Academy of Sciences held its first working meeting, upon which occasion Gen. C. W. Irish read a very interesting paper on "The Air-Currents of Western Nevada." The officers of this new scientific society are, president, Gen. C. W. Irish, surveyor-general of Nevada; vice-president, C. W. Friend, director Nevada State Weather Service; secretary, Professor R. D. Jackson, State University; treasurer, J. Rankin; executive committee, the president, secretary, and the following, — Dr. LeRoy D. Brown, State University; Professor W. McN. Miller, State University; and E. M. Van Harlengen.

— Dr. S. Weir Mitchell of Philadelphia has .been elected president of the Congress of American Physicians and Surgeons, which meets in Washington in September, 1891.

— Herbert Spencer, according to a London correspondent of the New York *Sun*, has returned to London with his autobiography completed up to the present time. It is not to be published until after his death, but he is making preparations for it to be produced then on both sides of the Atlantic simultaneously. The manuscript has been put into type, and three proofs only are taken, all of which are sent to him. Before the type is distributed, two moulds are taken for stereotyping, one of which is to be sent to America, where Spencer is more widely read than in England, to be used immediately upon his death.

— Professor L. H. Bailey, of the Agricultural Experiment Station of Cornell University, sent a large number of circulars to leading fruit-growers in New York and Michigan, asking for definite information in regard to windbreaks, and, as a general summary of the result, makes the following statements: — 1. A windbreak may exert great influence upon a fruit plantation. 2. The benefits derived from windbreaks are the following: protection from cold, lessening of evaporation from soil and plants, lessening of windfalls, lessening of liability to mechanical injury of trees, retention of snow and leaves, facilitating of labor, protection of blossoms from severe winds, enabling trees to grow more erect, lessening of injury from the drying-up of small-fruits, retention of sand in certain localities, hastening of maturity of fruits in some cases, encouragement of birds, ornamentation. 3. The injuries sustained from windbreaks are as follows: preventing the free circulation of warm winds and consequent exposure to cold, injuries from insects and fungous diseases, injuries from the encroachment of the windbreak itself, increased liability to late spring frosts in rare cases: (*a*) The injury from cold, still air is usually confined to those localities which are directly influenced by large bodies of water, and which are protected by forest belts (it can be avoided by planting thin belts); (*b*) The injury from insects can be averted by spraying with arsenical poisons; (*c*) The injury from the encroachment of the windbreak may be averted, in part at least, by good cultivation and by planting the fruit simultaneously with the belt. 4. Windbreaks are advantageous wherever fruit plantations are exposed to strong winds. 5. In interior places, dense or broad belts, of two or more rows of trees, are desirable; while, within the influence of large bodies of water, thin or narrow belts, comprising but a row or two, are usually preferable. 6. The best trees for windbreaks in the North-eastern States are Norway spruce, and Austrian and Scotch pines, among the evergreens. Among deciduous trees, most of the rapidly growing native species are useful. A mixed plantation, with the hardiest and most vigorous deciduous trees on the windward, is probably the ideal artificial shelter belt.

— By permission of the trustees of the Lowell Institute, Boston, the curator, Professor Alpheus Hyatt, is enabled to distribute a limited number of tickets to teachers of private schools and members of the Boston Society of Natural History who desire to attend the course of lectures described below. Applications for tickets should be made immediately at the library in the society's building. Professor W. O. Crosby will give a course of ten lessons during the winter of 1889–90, upon the physical history of the Boston Basin. The course of lessons on the geology of Boston and vicinity given last winter was devoted to a general and systematic study of the geological phenomena of the Boston Basin, in which the various principles of dynamical and structural geology were taken up in the order of the text-book, and studied in connection with those localities in which they could be most satisfactorily illustrated, each class of phenomena being referred only to that part of the basin in which it had its finest development. This comprehensive course in geology may therefore be regarded as having formed a suitable preparation for the lessons to be given during the coming winter. The principal object of this second series of lessons will be to apply the principles of the first series to a thorough and detailed study of the physical history of the Boston Basin. Each important locality or natural division of the Boston Basin will form the subject of a separate lesson, in which its structural features, and, so far as they can be made out, the more important events of its history, will be presented as fully as the time will permit. Special attention will be given to tracing the relations of the existing surface feature of each district to its geological structure, and thus connecting the physical geography and geology of the region. The concluding lessons will summarize the results of these detailed studies; and an attempt will be made to present a picture of the Boston Basin at each principal epoch of its history. The course will be freely illustrated by specimens, maps, and diagrams, and also by a relief map or model of the Boston Basin, which will be colored to represent geological features. The lessons will be given, as usual, in Huntington Hall, in the Massachusetts Institute of Technology, beginning Oct. 12. Doors will be closed at 3 P.M.

— A tramcar line is being constructed in the Argentine Republic which will connect Buenos Ayres with the outlying towns, and will, when finished, extend over two hundred miles. The cars will be drawn by horses, which are cheap and plentiful in South America; while fuel, both wood and coal, is scarce and expensive. The rolling-stock consists of five sleeping-cars eighteen feet long, each with six beds, which in the day-time are rolled back to form seats; four two-storied carriages; twenty platform-carriages; six ice-wagons; four cattle-trucks; and two hundred goods vans.

— Professor J. B. Smith, entomologist of the New Jersey Experiment Station, in a recent bulletin, tells the farmers and gardeners of the State how they can help him in his investigation of insect-pests. His first counsel is to be prompt, instead of waiting till the damage is done and the pests have disappeared; and he adds, "Do not waste time in describing insects. Send specimens, and send plenty of them. If an insect is really injurious, it is as easy to get a dozen as it is to get one, and it makes it a great deal easier for the entomologist. He wants two or three to put in alcohol, so that he will know them next time; the others he wants to bring to maturity, or to describe or figure so as to complete his knowledge of them. Such specimens, if dead, should be packed in some soft material, as cotton or wool, and put into a stout tin or wooden box. They go by mail for one cent per ounce. Never send insects loose in a letter. The postal-clerk always smashes them flat, so that they are never of any use as specimens, and frequently not recognizable. With the specimen send also, so far as possible, a sample of the kind of injury caused by it, — a bored twig or root, or gnawed stem, fruit, or leaf, — any thing to show how the insect works. If at all possible, send the insects alive, along with a supply of their ordinary food sufficient to last during the journey. Pack them in a tight box, and do not punch air-holes in it. Insects need very little air, and the tight box keeps the food moist. Send with the insect an account of what you know of it, — how it works, whether on leaves, twigs, or fruit, whether above ground or under ground; how long you have known it; how much damage it has done; what experiments looking to its destruction have been made, and what the result has been. Such facts are often not only of the highest scientific interest, but also of the greatest practical importance."

— Among other reports received by the United States Hydrographic Office, we would call attention to two, — one from Capt. James P. White, of the American schooner "Ada Bailey," who reports that he used oil with wonderful effect in the late storm, and did not ship any water after he got his oil-bag over the side of the vessel. He always uses a cone-shaped bag stuffed half full of oakum, and prefers kerosene to any other oil. He says that he has been using it for five or six years, and believes that it is better than a thicker oil, although he has mixed fish-oil with kerosene, obtaining good results. It is his custom to keep a supply of oil always on hand for this purpose, and he uses from one to three barrels of oil every long cruise. The other was from Capt. McCrae, of the British schooner "Atwood," dated Sept. 9, in which he stated that when about 45 miles south of Sandy Hook, wind north-east, and a tremendous sea running, the jibs were washed away from off the bowsprit and jibboom, and bowsprit and mainmast sprung. Tremendous seas coming aboard smashed down the after-companion-way, bent the stern boat-davits, carried away the boat, and broke the rails. He used paint-oil mixed with kerosene and grease in canvas bags, hung from forward aft on the weather side, keeping them replenished every six hours. The oil proved a great benefit,

as the seas broke over no more; and the captain is of the opinion that the vessel was saved from further damage. During the 9th the vessel was hove to to a drag.

— The Natural Science Association of Staten Island was organized Nov. 12, 1881, with a membership of fourteen, and during the first two years of its existence no records were published. It was thought better to first ascertain, by actual experience, whether the association was reasonably sure of becoming a permanent institution. At the end of this period the steady growth which it showed both in membership and contributions, and the encouraging recognition which was received from all directions, seemed to justify the experiment. Accordingly the publication of the "Proceedings" was begun. These have since been issued, without interruption up to the present time, partly in the form of records of the regular meetings of the association, and partly as "extras" or "specials," which latter were published at such times as were found to be most convenient. It was decided at the beginning to print only such material as was of strictly local interest, in the firm conviction that the chief value of the "Proceedings" would be to serve as authentic records of facts in regard to the natural history and antiquities of the island. If such records had been kept during the past fifty years, many items of value and interest would have been preserved, which are now either lost entirely or else amount to mere uncertain tradition. Even within the past five years the rapid growth of the community has obliterated many of the most interesting natural objects, and these "Proceedings" are now the only definite records that they ever existed, and contain the only published authentic facts in connection with them.

— A congress composed of planters, exporters, and persons interested in the sugar-production of Java, has been held at Samarang. The object of this congress was mainly to discuss the cause and cure of the nematode attacks on the cane-roots, there called the "sereh" disease, which is now spreading most rapidly and disastrously through the cane-fields of western and central Java, having been first discovered on the island only three years ago in plantations near Cheribon, a seaport town on the north coast 125 miles to the eastward from Batavia. The congress subscribed a fund of $90,000 for the purpose of engaging a bacteriologist from Europe to visit the island, investigate the disease, and propose its remedy. The nematodes reduce not only the quantity of the sugar-crop, but its quality as well, and the subject is therefore of the utmost importance in cane-growing regions.

— The second report of the Chinese prize-essay scheme, in connection with the Chinese Polytechnic Institution and Reading-Rooms, Shanghai, has been printed, and the following particulars are extracted from it: Since the last report, which was published in 1887, the scheme has been steadily worked, and has now expanded into far more extensive proportions. By its means the existence of the Polytechnic Institution has become known far and wide, the co-operation of some of the highest officials in the empire secured, and an interest in Western ideas has been created in some of the most influential quarters. By the annual expenditure of only a hundred taels or thereabouts, and by working in harmony with the Chinese methods of thought, and time-honored systems of literary competition, a result has been obtained which the use of large sums of money in other ways would have failed to produce. The various other officials who have taken part in this undertaking have generally shown a wonderful insight into the needs of China at the present time; and although their questions relate, perhaps, more to political economy and commerce than to the severer branches of science, it is still gratifying to see how patriotic they are, and how they regard knowledge from the practical, utilitarian point of view rather than from the theoretical alone. The following questions are taken from the list of subjects given by the various high officials: Write a discourse on the naval defences of China. What ought China at the present time to regard as of the foremost importance in her endeavors to improve in wealth and power? What advantages and disadvantages would China realize by the establishment of railways? Compare the sciences of China and the West, showing their points of difference and similarity. How can the evils attending the introduction of telegraphs and steamboats in China be removed, and the benefits be rendered permanent? What is the cause of the present unprofitable state of the trade in tea and silk, and how can the difficulties be remedied? The calamities of inundations and droughts, how can they be provided against in ordinary times; and when they happen, how can they be remedied or ameliorated?

— The annual meeting of the American Forestry Congress will begin in Philadelphia Oct. 15, and continue four days. The sessions are to be held in Horticultural Hall, Broad Street, and Gov. James A. Beaver will preside. A number of interesting papers upon forestry and kindred subjects have been prepared, while, through the liberality of citizens and organizations, courtesies have been promised to those attending the congress which will make the meeting most enjoyable.

— Recent advices from one of the California agents of the United States Entomological Bureau, Mr. D. W. Coquillett, show that the published statements in the California newspapers of late date, to the effect that the plum curculio has made its appearance in Los Angeles County, are entirely unfounded. Fuller's rose-beetle (*Aramigus fulleri*) has been mistaken for *Conotrachelus nenuphar*. The rose-beetle has been found to be very destructive in that vicinity to the leaves of evergreen oaks, camellias, palms (*Washingtonia fillifera*), *Canna indica*, and several other plants.

— At Marseilles, Bordeaux, and Poitiers public exhibitions of hypnotism have been forbidden. The Paris correspondent of the *British Medical Journal* writes, "The Departmental Council of Public Health advised the rector of the Academy to take this step in the districts under his authority, and he wisely followed the good advice. In Belgium, Geneva, and Mecklenburg-Schwerin they are likewise forbidden. In Paris, unfortunately, unwise doctors can show off their patients, and quacks follow in their steps with unwholesome imitations."

— Dr. George M. Sternberg, surgeon in the United States Army, has just returned from a six-months' stay in Cuba, where he has been continuing his researches with reference to yellow-fever. He has brought with him specimens of microbes, with which he will continue his investigations during the winter at the Johns Hopkins University. At the end of this time he hopes to present a general report of his investigations to President Harrison. "My researches," says Dr. Sternberg, "have not led to a positive demonstration of the specific cause of the disease; but I have isolated a considerable number of pathogenic bacilli, disease-producing germs, from the intestines of yellow-fever cases, and have strong hopes that one or more of these may prove to be the specific germ. I have confirmed my previous conclusions as to the absence of a specific micro-organism in the blood and tissues of the patients, and have failed to find in any of my cases the germ which Dr. Frere of Brazil has claimed to be the cause of the disease. For this reason I have given my attention entirely to the bacilli of the alimentary canal."

— "The American Electrical Directory" for 1889, published by the Star Iron Tower Company of Fort Wayne, Ind., possesses many features of interest and value to electricians and to all persons interested in electrical matters. In its thousand pages it gives a report of the proceedings of the National Electric-Light Association meetings in New York and Chicago, 1888 and 1889; lists of the isolated arc and incandescent plants in the United States and Canada; the Philadelphia schedule for public lighting; a carefully compiled list of the prices charged for gas in cities and towns having a population of over ten thousand; and reports of the various electric light and power companies in the United States, Canada, and Mexico. There are also lists of electric-light and railroad companies and their officers, of electric manufacturing, construction, and supply companies; rules of the New England Insurance Company, and of the New York Board of Fire Underwriters and Board of Electrical Control; and many tables and formulas of use to electricians.

— Harold Roorbach will issue shortly a handy volume for the aspiring dramatist in "The Art of Play-Writing." Written by a well-known playwright, it treats on every class of dramatic composition, and gives withal some hardheaded advice.

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

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CONTENTS:

THE "PILOT CHART" of the North Atlantic Ocean for October, issued Sept. 27 by the Hydrographic Office, Navy Department, is of especial interest as showing the tracks of the hurricanes that have been experienced on the Atlantic during the past month, and the positions of the many derelicts and wrecks reported off the coast, — the results, most of them, of the great storm that raged between Hatteras and Block Island from the 9th to the 12th of September. So great is the interest that attaches to this storm, that a special supplement to the chart has been issued, entitled "The St. Thomas-Hatteras Hurricane of Sept. 3–12, 1889." This gives, by means of ten synoptic charts and descriptive text, the entire history of the hurricane from the time it passed St. Thomas till it had spent its fury off the coasts of New Jersey and Long Island. In spite of the brief interval of time that has elapsed, an astonishingly large number of reports have been collected from masters of vessels; and each chart contains data as far east as the 50th meridian, and as far south as the 10th parallel. A new and very important factor in the history of the hurricane is brought out very clearly. It seems that a second hurricane originated in the tropics almost simultaneously with the first, but about a thousand miles farther east. Both moved off along a track toward west-north-west, but the second recurved to the north-east below Bermuda. To this second hurricane was due the building-up and persistency to the southward of Newfoundland of a ridge of high pressure that held the great storm off our coast, instead of allowing it to follow its normal track toward the north-east. Special credit is given to the many navigators whose cordial assistance has made it possible to publish this report so promptly.

AMERICAN PUBLIC HEALTH ASSOCIATION.

THE following is a partial list of papers to be presented at the annual meeting of the American Public Health Association, to be held in Brooklyn beginning Oct. 22 (a full list will appear in the daily programmes): address of welcome, by Hon. Alfred C. Chapin, mayor, on behalf of the city; address of welcome, by Alexander Hutchins, M.D., on behalf of the medical profession; president's address, by Professor Hosmer A. Johnson, M.D., Chicago, Ill.; "The United States Census in its Relation to Sanitation," by Dr. John S. Billings, LL.D., Washington, D.C.; "Recent Researches relating to the Etiology of Yellow-Fever" (illustrated with the stereopticon), by George M. Sternberg, M.D., Baltimore, Md.; "More Yellow-Fever Problems," by Jerome Cochran, M.D., State health-officer, Montgomery, Ala.; "Forms of Statistics," by Henry B. Baker, M.D., secretary State Board of Health, Lansing, Mich.; "A Suggestion for the Limitation and Detection of Adulterations in Food and Drink," by Henry Leffmann, M.D., Philadelphia, Penn.; "The Prevention of Consumption," by J. N. McCormack, M.D., secretary State Board of Health, Bowling Green, Ky.; "The Necessity for a More Rigorous Inspection of Meat-Producing Animals at the Time of Slaughter," by D. E. Salmon, D.V.M., chief of Bureau of Animal Industry, Washington, D.C.; "The Causes of Infant Mortality," by Dr. R. O. Beard, assistant commissioner of health, Minneapolis, Minn., and professor of physiology in the medical department of the Minnesota State University: "Causes and Prevention of Infant Mortality," by Jerome Walker, M.D., Brooklyn, N.Y.; "The Utilization and Purification of Sewage," by John H. Rauch, M.D., secretary State Board of Health, Chicago, Ill.; "The Art of Cooking," by Edward Atkinson, LL.D., Boston, Mass. (this paper will be practically illustrated by cooking apparatus devised by Mr. Atkinson, and various foods will be cooked in the presence of the association; the system which will be illustrated is the result of several years' labor, and has been in practical operation for many months under his supervision; as Mr. Atkinson is one of the world's most noted economists and statisticians, the paper will undoubtedly be of great value); "New Method of Dealing with the Dead" (illustrated with the stereopticon), by Rev. Charles R. Treat, New York City; "Report of the Committee on the Disposal of Garbage and Refuse Matter," by S. S. Kilvington, M.D., commissioner of health, Milwaukee, Wis.; "A Suggested Minimum Basis of Compensation to Local Health-Officers," by George Homan, M.D., secretary State Board of Health, St. Louis, Mo.; "Do the Sanitary Interests of the United States demand the Annexation of Cuba?" by Benjamin Lee, M.D., secretary Pennsylvania State Board of Health, Philadelphia; "Railway Sanitation," by Samuel W. Latta, M.D., medical examiner Pennsylvania Railroad Voluntary Relief Department, Trenton, N.J. Papers and reports of an interesting and valuable character are expected from several of the committees.

A daily programme will be issued each morning, giving the title of papers, reports, etc., that will be presented, with such other information as may be of interest in connection with the work of the day. The headquarters of the executive committee will be at the Pierrepont House. A meeting of the committee will be held at this house, at the room of the secretary, on Monday, Oct. 21, at 4.30 P.M.

The local committee of arrangements have provided for an exhibition of every thing available adapted to the promotion of health. The exhibit will be divided into nine sections, as follows: 1. The Dwelling; 2. Schools and Education; 3. Factories and Workshops; 4. Clothing and Dress; 5. Food; 6. Sanitary Engineering; 7. Public Health Administration in Cities and Towns; 8. The Laboratory; 9. Red Cross Section. The exhibition of any article does not carry with it the indorsement of the American Public Health Association. At the close of the exhibition the association will award testimonials to exhibiters of especially meritorious articles, based upon the judgment of experts. The exhibition will be held in the hall at the north-west corner of Fulton and Pineapple Streets,

one block from the Brooklyn Institute, where the sessions of the association will be held, and but three blocks from the Bridge. It will be open to the public on Oct. 22, at 1 P.M., and will continue open until Dec. 1. Admission free. For particulars relative to the exhibit, address the chairman of the committee, Dr. A. N. Bell, 113A Second Place, Brooklyn, N.Y.

By invitation of Dr. William M. Smith, health-officer of the port of New York, the association will visit the New York Quarantine Station. For this purpose Dr. Smith has placed at the service of the association a commodious steamboat. The trip will probably be made Wednesday afternoon, Oct. 23.

The local committee of arrangements will issue a circular giving full information regarding reduced hotel rates, railroad fares, etc., a copy of which will be sent to every member of the association. Others desiring a copy should make application to the chairman of the committee, Dr. J. H. Raymond, 173 Joralemon Street, Brooklyn, N.Y., to whom all communications relative to local matters in connection with the meeting should be addressed. The usual rate of one and one-third fare for the round trip has already been secured over the Trunk Line, Central, and Southern Traffic Associations, and it is expected that the same rates will be obtained from the other traffic associations. To secure the reduced rates, a certificate must be obtained from the ticket-agent at the starting-point, certifying that the holder has paid full fare going to the meeting, over what lines he has travelled, etc., which certificate must be countersigned at the meeting by the secretary in order to secure the one-third return fare.

EXHIBITERS TO WHOM AWARDS HAVE BEEN MADE AT PARIS.

THE principal awards to American exhibiters at the Paris Exposition are as follows: —

GRAND PRIZES. — Boston public schools; Washington Bureau of Education; Washington Bureau of Ethnography; United States Service of Meteorology; United States Commission of Geology; United States Ministry of War; New York University; Rensselaer Polytechnic Institute, Troy; Smithsonian Institution, Washington; Johns Hopkins University, Baltimore; the Century Company, New York; Fairchild, New York, gold pens; United States Geological Survey; United States Signal Service, A. W. Greely, chief officer; United States Naval Observatory; Mr. Howland; United States Coast and Geodetic Survey; United States Army, Corps of Engineers; T. G. Hawkes, New York, crystal; Tiffany & Co., New York, silverware; J. B, Stetson, Philadelphia, fine fur hats; Winchester repeating arms; J. A. Fay & Co., Cincinnati, timber machines; Healey & Co., New York, carriages; Pennsylvania Railroad Company; Bell Telephone Company; Thomas A. Edison; Elisha Gray, Illinois, telegraphy; Elihu Thomson, Lynn, Mass., electrical appliances; Government Bureau of Engineers; United States Exhibit of Cereals; Bergher & Engel Brewing Company, Philadelphia; C. A. Wetmore, California, wines; United States Department of Agricultural Statistics; United States Farms; C. V. Riley, specimens of phylloxera work; United States Agricultural Department of Viticulture; Labor Departments of the United States reports.

GOLD MEDALS. — E. Barnes & Co.; Ivison, Blakeman, & Co.; Board of Education, Wisconsin; Buffalo public schools; Department of Public Instruction, California; Department of Public Instruction, Iowa; Elizabeth (N.J.) public schools; Moline (Ill.) public schools; Bureau of Education, Washington; National Deaf-Mute College, Washington; Ohio, commissioner of schools; Perkins Institute for the Blind, Massachusetts; Pittsburgh public schools; Sockanossett School for Boys; State Public School, Coldwater, Mich.; Indiana Industrial School; Galveston public schools; Boston public schools; State of Massachusetts, Department of Public Instruction; public schools, California; public schools, Wisconsin; public schools, Michigan; American Museum of Natural History, New York; Chicago Public Library; Eastman College, Poughkeepsie; Manual Training School, Philadelphia; Massachusetts Institute of Technology, Boston; Houghton, Mifflin, & Co., Cambridge, Mass.; Lippincott & Co., Philadelphia; Merriam, Springfield, Mass.; New York Bank Note Company; Warren & Co., papers, Boston; Tiffany & Co., jewelry; Prang & Co.; Barker, photographs, New York; H. A. Rowland; Eastman Dry Plate Company; Manual Training School, St. Louis; University of California; Darlin, Brown, & Sharpe, Providence; Herman Hollerith, Washington; Mr. Gardner; J. P. Lesley, State geologist of Pennsylvania; Heywood Brothers, New York, furniture; C. E. Henry, Indianapolis, glass; John Lafarge, New York, stained glass; Rookwood Pottery Company, Cincinnati; Gorham Silverware Company; Meriden Britannia Company; Colgate & Co., New York, perfumery; Ladd & Coffin, New York, perfumery; William Demuth, New York, pipes; Tiffany, leather goods; Marks's folding-chair, New York; Boston Rubber Shoe Company; Mayer, Strouse, & Co., New York, corsets; Beneke Brothers, New York, boots; Dunlap, New York, hats; War Department, uniforms; N. J. Schloss & Co., New York, clothing; Colt's fire-arms; Smith & Wesson; Union Metallic Cartridge Company; White Sewing-Machine Company, Cleveland; Mackellar, Smith, & Co., New York, printing type; American Writing Machine Company, Hartford; Remington typewriter; Hammond typewriter, New York; Cobb Vulcanite Wire Company; Heisler Electric Light Company, St. Louis; Okonite Company, New York; Western Electric Company, Chicago; Sprague Tramway Company; Volta Graphophone Company; Herring & Co., New York, safes; Yale Manufacturing Company; Inman Steamship Company; Chicago and Minneapolis Boards; Glen Cove Manufacturing Company; C. A. Pillsbury of Minneapolis; Green Mountain Stock Farm; J. H. Michener & Co., Philadelphia, lard; Armour & Co., Chicago, canned meats; Curtice Brothers, canned meats; Cassard & Co., Baltimore, dried meats; Michener & Co., dried meats; Morris & Co., Chicago, canned meats; Swift & Co., dried meats; Maillard, New York, bonbons; Beadleston & Co., lager beer; California State Viticultural Commission; Chauche & Co., California, wines; J. Kunz, New York, beer; Montgomery Brewery Company; Megliavalla, California, wines; J. Osborn & Sons, New York, whiskey; United States agricultural maps and charts; Enterprise Manufacturing Company; Richmond Cedar Works; Clayton & Co., gratings; H. O. Nelson; N. P. Gilman; C. D. Wright; Publication Agency for Johns Hopkins University; Universal Peace Union, Philadelphia; New York and Massachusetts Labor Departments; Woman's Christian Temperance Union.

BOOK-REVIEWS.

Essays upon Heredity and Kindred Biological Problems. By AUGUST WEISMANN. Authorized translation by Edward B. Poulton, Selmar Schönland, and Arthur E. Shipley. Oxford. 8°.

PROFESSOR WEISMANN'S essays on various general problems of biology have never been collected, but have remained more or less inaccessible in sundry journals or as separate pamphlet publications. Being now brought together in a single handsomely printed volume, they will doubtless attract a wider attention not only from naturalists, but also from thoughtful general readers. The author's presentation of his subject is, except in two or three minor essays, such that his arguments may be followed without the detailed knowledge of a specialist.

The translations are very well done, for the English, while idiomatic, renders accurately the meaning of the original German; so that the volume is a thoroughly trustworthy reproduction of Professor Weismann's theories. These theories are full of suggestiveness, and contain many original conceptions. It must be recognized that their influence will be far felt, especially as opposing some of the ideas concerning heredity, sexuality, death, etc., which tradition has rendered current, one might almost say orthodox, in the biological world. There is in biology, around the finished area, — the woven tissue of science, — a fringe of dogma; and playing with this fringe is to certain minds a favorite occupation. We see sober investigators, who are conscientious within the region of the provable, become intoxicated when they attempt to pass outside this region. They then madly maintain dogmas, asserting positive views as to the nature of life, which is entirely beyond their power to justify. This special tendency is so infectious that the majority of biologists are affected by it, and defend their par-

ticular idea as to vitality with an acrimony which makes it unbecoming for any biologist to speak slurringly of the *odium theologicum*. Now, Professor Weismann leads attention back to scientific sobriety as regards these wide-reaching problems about fundamentals, and thereby renders a most welcome service; for, after all, it is pleasant to leave the *feux follets* for the sake of genuine light and real safety.

One is obliged to dissent from many of Professor Weismann's views, which are marked by that vagueness that is so characteristic of German philosophic generalizations. Some of his conclusions we already know to be deficient and even erroneous. This is notably the case with his conception of death, to which he recurs frequently, for he fails to make the obvious distinction between the death of a unicellular and that of a multicellular organism. A colony is not homologous with its units, and the breaking-up of a colony is not homologous with the destruction of an individual; yet Professor Weismann makes it so. But the value of a book lies not in its faults or deficiencies; and, though these need to be noted as making its limitations, a book is to be judged by its merits.

The book before us is one of many and signal merits. The first essay, on the duration of life, was originally presented to the world in the form of an address to the German Naturforscherversammlung at Salzburg in September, 1881, and was shortly after published in pamphlet form at Jena. It deals with the duration of life, and constitutes the basis of the subsequent essays of the series. The second essay, on heredity, followed two years later, and completes in outline the author's theories. The remaining six essays serve essentially to elaborate and supplement the first two. The most important contribution to thought is the defence of the theory of germinal continuity against Darwin's theory of pangenesis as an explanation of heredity. The hypothesis of germinal continuity was originated by Moritz Nussbaum, to whom the first credit belongs: but Weismann has so identified himself with its defence and amplification, that we may say that the gradual acceptance of the hypothesis in place of that of pangenesis is due principally to his teaching. He has adduced numerous facts, and numerous interpretations in favor of his position; and it is, we believe, not too much to say that within a short time the new theory of heredity must find general acceptance. Those, therefore, who wish to keep abreast with the tendencies of biological advance must read Weismann, and *must* not only on account of the theory we have specially referred to, but also on account of other fresh thoughts and ideas which vivify his interesting pages.

European Schools. By L. R. Klemm. New York, Appleton. 12°. $2.

This book is the latest issue in the International Education Series, in which it well deserves its place. The author spent a year or so in visiting the schools of Germany and France, with short trips to Switzerland and Vienna. Most of his attention was given to the German schools, and his account of these is full and interesting. He is evidently a keen observer, and studied the schools he visited with great care and diligence. The matters of which he treats are generally of great interest, though manual training and drawing are accorded altogether too much space in proportion to their importance. These subjects and some others are largely illustrated from drawings by the author himself. Mr. Klemm reports nothing of special interest from France or Vienna, while in Switzerland he seems to have been almost disgusted with what he saw. He condemns the Swiss schools in unmeasured terms as ill furnished and worse taught, and it is only in Germany that he finds much that he regards as an improvement on what we have in America.

The difference of method between the German schools and ours is indeed great; but whether we should do well to abandon our methods for theirs is questionable. The distinctive characteristic of German teaching as described in this book is the absence of text-books, the instruction being conveyed orally by the teacher. This is the case, for instance, in geography, physics, and natural history; and it is obvious that the introduction of such teaching into American schools would amount to a revolution. But the method of question and answer employed by the German teachers, of which Mr. Klemm gives many interesting examples, is unquestionably of great value, being fitted not only to test the pupil's knowledge, but also to make him think. Object-lessons, it appears, have gone out of favor in Germany; but, on the other hand, drawing is employed to illustrate every subject that requires such illustration. A particular account is given of a "school for dullards" at Elberfeld, which has proved a very useful institution.

Mr. Klemm attributes the excellence of the German schools largely to the careful training of the teachers, and accordingly devotes some space to a description of the normal schools. He reports, however, that there is at present a scarcity of teachers in the kingdom of Prussia, — a fact which he attributes to the low salaries paid, it being easy for intelligent men to get higher pay in other employments. The teachers, nevertheless, are enthusiastic in their work, and, though subject to strict rules, show a good deal of individuality in their teaching. Women teachers are comparatively rare in Germany, and there is a strong prejudice against them; but this will doubtless disappear in the course of time. We cordially commend Mr. Klemm's book to the attention of American teachers.

The Key to Theosophy. By H. P. Blavatsky. London, Theosoph. Publ. Co.; New York, W. Q. Judge. 12°.

This work is intended as an introduction to theosophy, and is written in the form of a catechism. It gives some account of the character and objects of the Theosophical Society, and then goes on to expound the leading doctrines that theosophists believe in — or pretend to believe in. The doctrines chiefly dwelt on in this book are pantheism and metempsychosis; but we think the reader will understand them less after perusing Mrs. Blavatsky's account of them than he did before. The practical aims of theosophists, it seems, are virtually identical with Christian charity, and it is only on speculative questions that the new sect antagonizes the world. It is very unfortunate that the real esoteric doctrines of the sect are so profound, that, as we are told, only a very few persons can comprehend them; and we are sorry to say that we are not among the favored few. Indeed, we should incline to characterize much of this book as rank nonsense, if we were not solemnly assured by the authoress that "theosophy is synonymous with everlasting truth." She refers feelingly to the fact that the Society for Psychical Research had employed a man to investigate some of her statements, and had characterized her as "the most accomplished impostor of the age," and says that she regards them with contempt, and that she will not abandon her principles because they have been attacked by "a flock of stupid old British wethers, who had been led to butt at them by an over-frolicksome lambkin from Australia." Evidently theosophy and modern ideas don't agree well together, and we fear that Mrs. Blavatsky and her co-religionists will have a hard task to convert the world to their views.

Iron and Steel Manufacture. By Arthur H. Hiorns. London and New York, Macmillan. 16°. $1.

Beginners in the study of metallurgy will find this an excellent little work from which to gain a knowledge of the fundamental principles of the various processes employed in the manufacture of iron and steel. They will also find it a compendium of the various properties of those metals, so far as those properties can be treated in an elementary manner.

The book, of course, will not supersede any of the larger and more exhaustive manuals on the subject, nor is it intended by the author that it should do so. It is designed merely as an elementary treatise to prepare the student for a more advanced course of study, though manufacturers and workmen connected with trades in which iron and steel are used will find much of its contents of value to them. For the convenience of those having but a limited knowledge of chemistry, a chapter is devoted specially to a discussion of chemical principles and changes, so far as they have a bearing upon the subject of which the volume treats. The book is fully illustrated, and furnished with a very complete index.

AMONG THE PUBLISHERS.

The Elder Publishing Company, Chicago, have nearly ready "Birds and Butterflies," a book for boys and girls, by M. G. Musgrave.

— Admiral David D. Porter's forthcoming book is to be entitled "Arthur Merton."

— One of the important announcements of fall publications is that of a volume of "Orations and After-Dinner Speeches," by Chauncey M. Depew, which Cassell & Co. (Limited) have in preparation. Very few of these have ever been printed in their entirety, and many of them have only been dealt out in fragments by the daily papers, and yet he has won a world-wide reputation by them. It may be said, by the way, that it took no little diplomacy to induce Mr. Depew to consent to the publication of his orations and after-dinner speeches; but he was finally convinced that the public wanted them, and, as he is a great believer in the public, he consented. The book is now on the press, and will be published with a steel portrait of Mr. Depew.

— *School* is the title of a new educational journal which will be published weekly from No. 10 East 14th Street, New York City. It will be edited by H. S. Fuller, an experienced journalist, and one who is entirely familiar with every thing that pertains to the public schools. *School* intends to cover in some degree every department of its chosen field, and to offer something that will be acceptable to every worker in that field.

— Mr. Andrew Lang has edited a collection of some forty of the best of the good old fairy-stories, to be published shortly by Longmans, Green, & Co. as "The Blue Fairy Book." He has sought to set down in strict accord with accepted tradition the most familiar of the popular tales of Greece, Germany, France, and England. "The Blue Fairy Book" will have numerous illustrations by Mr. Jacomb-Hood and Mr. H. J. Ford.

— The series of articles upon "Nursery Cookery," which has been running in *Babyhood*, has proved valuable, and has helped to popularize the fact, that, however skilfully and judiciously food for children may be selected, such labor is frequently lost by being supplemented by poor cooking. Parents who wonder that their little ones do not thrive, although the best of food is provided, may find here an important hint. The chapter in the October number deals with rice, potatoes, and bread. *Babyhood* is published in New York, at $1.50 a year.

— Lea Brothers & Co., will shortly publish a "Text-Book of Chemical Diagnosis," by Dr. Rudolph von Jacksch, translated by James Cagney, M.D., and William Sterling, M.D., in one handsome octavo volume, with numerous illustrations.

— J. W. Bouton is taking subscriptions for a limited edition of "The Soft Porcelain of Sevres," with an historical introduction by Edward Garnier, translated by H. F. Andresen. There will be ten parts, each having five plates.

— A. Lovell & Co., New York, have published the two concluding parts (Nos. 1 and 6) of the "Graphic System of Object-Drawing," by Hobart B. Jacobs and Augusta L. Brower. This system, which is based on the methods of the best Paris art teachers, is designed to give the pupil a clear idea of form, to help him to express that idea on paper, and to give him command of his pencil, so that he can draw the objects about him. The plan is quite simple, and a manual for teachers makes the system plain even to teachers unskilled in the art. The price per dozen is $1.20. A sample set, with manual, will be sent for examination for sixty cents.

— Cassell & Co. have in press an important work on New Zealand by Edward Wakefield, who has held many high official positions under the New Zealand Government, now being one of the commissioners for that region at the Paris Exposition. It is to be entitled "New Zealand after Fifty Years."

— Alongside of the Volapük enthusiasts there are a few men in this country, as well as in Europe, who are working to reinstate Latin as the language of science, if not of general communication between the nations of the world. These may be encouraged to learn that a periodical, written in chaste and elegant Latin, has recently appeared in Aquila degli Abruzzi, in Italy. It is edited by Carlo A. Ulrichs, a young Latin scholar of considerable reputation, and is published semi-monthly. Six numbers have already appeared, and the editor announces that the subscription-list is increasing in a very satisfactory manner, and contains the names of many scholars in Europe and America. The name of the periodical is *Alaudæ* (Larks). It is a purely secular journal, being filled with poems, stories, anecdotes, jokes, and news.

Publications received at Editor's Office, Aug. 26-Sept. 21.

AMERICAN Electrical Directory for 1889. Fort Wayne, Ind., Star Iron Tower Co. 998 p. 8°. $5.

ANDREWS, E. B. Institutes of Economics. Boston, Silver, Burdett, & Co. 227 p. 12°.

ASTRONOMICAL OBSERVATORY of Harvard College, Annals of the. Vol. XIX. Part I. Cambridge, University Pr. 157 p. 4°.

—— Same. Vol. XX. Part II. Cambridge, University Pr. 267 p. 4°.

BAKER, C. W. Monopolies and the People. New York and London, Putnam's Sons. 263 p. 12°. $1.25.

BALDWIN, J. M. Handbook of Psychology. New York, Holt. 343 p. 8°.

DUMAS, A. Les Trois Mousquetaires. Ed. by F. C. Sumichrast. Boston, Ginn. 133 p. 12°. 80 cents.

EGGLESTON, E. A First Book in American History. New York, Appleton. 203 p. 12°. 70 cents.

GEORGE, A. J. Selections from Wordsworth. Boston, Heath. 434 p. 12°. $1.35.

GORE, J. H. A Bibliography of Geodesy. (Appendix No. 16 — Report for 1887.) Washington, Government. 198 p. 4°.

HEILPRIN, A. The Bermuda Islands. Philadelphia, The Author. 231 p. 8°.

HICHBORN, P. Report on European Dock-Yards. Washington, Government. 90 p. 4°.

HIORNS, A. H. Iron and Steel Manufacture. London and New York, Macmillan. 180 p. 16°. $1.

LITTLEHALES, G. W. The Development of Great Circle Sailing. Washington, Government. 52 p. 8°.

MAINE, Fourth Annual Report of the Board of Health of the State of, for 1888. Augusta, State. 336 p. 8°.

MARENHOLTZ-BUELOW, Baroness. The Child and Child Nature. Syracuse, Bardeen. 207 p. 8°. $1.50.

MORSE, J. T., Jr. Benjamin Franklin. (American Statesmen Series.) Boston and New York, Houghton, Mifflin, & Co. 428 p. 12°. $1.25.

MYERS, P. V. N. A General History for Colleges and High Schools. Boston, Ginn. 759 p. 12°. $1.65.

NAVAL Mobilization and Improvement in Matériel. (General Information Series, No. VIII.) Washington, Government. 485 p. 8°.

OHIO Agricultural Experiment Station, Seventh Annual Report of, for 1888. Columbus, State. 216 p. 8°.

PENNSYLVANIA GEOLOGICAL SURVEY, Annual Report of the, for 1887. Harrisburg, Geol. Surv. 115 p., plates. 12°.

PROCTOR, R. A. Strength: How to get Strong and keep Strong. London and New York, Longmans, Green, & Co. 178 p. 12°. 75 cents.

SMITHSONIAN INSTITUTION, Sixth Annual Report of the Bureau of Ethnology to the Secretary of the, 1884-85. By J. W. Powell, director. Washington, Government. 675 p. 4°.

WEIR, H. Our Cats and All about Them. Boston and New York, Houghton, Mifflin, & Co. 248 p. 12°. $2.

WENTWORTH, G. A., and REED, E. M. Wentworth's Primary Arithmetic. Boston, Ginn. 220 p. 12°. 35 cents.

ZUBIAUR, J. B. Quelques Mots sur l'Instruction Publique et Privée dans la République Argentine. Paris, P. Mouillot. 112 p. 8°.

— The following incidents are from an interesting illustrated paper by Dr. J. Emmet O'Brien of this city, in *The Century* for September, on "Telegraphing in Battle:" "In Butler's advance on the Petersburg and Richmond Railroad, May 7, a line was carried along with the column to within sight of that road, and worked until Beauregard struck us at Drewry's Bluff, on the 16th, when Gen. Butler ordered his chief operator to 'bring the line within the intrenchments.' In these trenches one night Maynard-Huyck was awakened from sleep, not by the familiar voice of his instrument, but by the shriek of a Whitworth bolt, a six-pound steel shell, which passed through the few clothes he had doffed, then ricochetted, and exploded beyond. Congratulating himself that he was not in his 'duds' at the moment, the boy turned over and slept through the infernal turmoil of an awakening cannonade until aroused by the gentle tick of the telegraph relay. We used no 'sounders' in those days at the front. In illustration of the sensibility of hearing acquired by the military operators for this one sound, the writer may be pardoned another personal incident. At Norfolk, in April, 1863, he happened to be alone in charge of the telegraph when Longstreet with a large force laid siege to Suffolk. In the emergency he remained on duty, without sleep, for three days and nights, repeating orders between Fort Monroe and the front. Toward morning on the third night he fell asleep, but was aroused by the strenuous calls of the fort, and asked why he had not given 'O. K.' for the messages just sent. He replied that none had been received. 'We called you,' said the operator at the fort; 'you answered, and we sent you two messages, but you failed to acknowledge them.' The despatches were repeated and forwarded, when, on taking up a volume of Scott's novels, with which he had previously endeavored to keep awake, the writer was astonished to find the missing telegrams scrawled across the printed page in his own writing, some sentences omitted, and some repeated. It was a curious instance of somnambulism."

— Funk & Wagnalls will publish this month a work entitled "The Life-Work of the Author of Uncle Tom's Cabin." The writer, Florine Thayer McCray, who is a personal friend of Mrs. Stowe, received permission two years ago to write this work from both Mrs. Stowe, and her son, Rev. C. E. Stowe, and received valuable assistance from them and other members of the family. It is to be finely illustrated, and contains about 450 pages. *The Publishers' Weekly* is informed, that, while this work dwells at some length on the history of "Uncle Tom's Cabin," — that masterpiece which thrilled the world and contributed so largely toward the overthrow of American slavery, — it also gives an interesting account of Mrs. Stowe's habits, travels, methods of work, and reviews and commentaries upon the numerous other books that fell from her facile pen. The forthcoming work is likely to have a wide circulation.

— Macmillan & Co. publish early in October "Pen Drawing and Pen Draughtsmanship," by Joseph Pennell. The work will contain numerous photogravures and other illustrations, including examples after Sir Frederick Leighton (president Royal Academy), E. J. Poynter, Frederick Walker, Randolph Caldecott, George Du Maurier, Linley Sambourne, Harry Furniss, William Small, W. L. Wyllie, Charles Keene, Ford Madox Brown, Frederick Sandys, E. A. Abbey, Alfred Parsons, Walter Crane, Hugh Thomson, Arthur B. Frost, Blum, Madame Le Maire, Rico, Cazenova, Lhermitte, Menzel, and numerous other well-known artists. The same firm also announce the following for publication: a new volume of poems by Lord Tennyson; a new volume of essays by Professor Huxley; "The Elements of Politics," by Professor Henry Sidgwick; "Problems of Greater Britain," by Sir Charles Dilke; "Wild Beasts, and their Ways in Asia, Africa, America, from 1845 to 1888," by Sir Samuel W. Baker, with illustrations; "On Style: with Other Studies in Literature," by Walter Pater; "Royal Edinburgh: her Saints, Kings, and Scholars," by Mrs. Oliphant, with illustrations by George Reid; "The Pre-Raphaelite Brotherhood," by W. Holman Hunt, with illustrations; "Cults and Monuments of Ancient Athens," by Miss Jane Harrison and Mrs. A. W. Verrall, with numerous illustrations; "A History of the Later Roman Empire from Arcadius to Irene, A.D. 395–800," by John B. Bury; "The Development and Character of Gothic Architecture," by Professor Charles H. Moore, with illustrations; "Eminent Women of Our Times," by Mrs. Fawcett; "Letters of Keats," edited by Sidney Colvin; "The Cradle of the Aryans," by G. H. Rendall; "The Makers of Modern Italy: Mazzini, Cavour, Garibaldi," by J. A. R. Marriott; "A Reputed Changeling; or, Three Seventh Years Two Centuries Ago," by Charlotte M. Yonge; "The Rectory Children," by Mrs. Molesworth, with illustrations by Walter Crane; "Text-Book of Physiology," by Professor Michael Foster, with illustrations, fifth edition, largely revised, in three parts; "Absolute Measurements in Electricity and Magnetism for Beginners," by Professor Andrew Gray, abridged edition; "Thermodynamics of the Steam Engine and other Heat Engines," by Cecil H. Peabody of the Massachusetts Institute of Technology; a new part (Vol. II., Part II.) of "A New Dictionary, founded mainly on the Materials collected by the Philological Society," edited by Dr. J. A. H. Murray; also Vol. III., Part I. (beginning with the letter E), edited by Henry Bradley, of the same work. A new edition of Chaucer's "Canterbury Tales," by Mr. John Saunders, assisted by Dr. Furnivall, is promised shortly. The Chaucer Society has permitted its Ellesmere manuscript cuts of the Tale-tellers to be used in the book. It was originally published in three of Charles Knight's "Weekly Volumes," and carries on the story of every tale by prose bits between the extracts, making it as easy to read as a modern novel.

— After writing about fairy-stories for years, Mr. Andrew Lang has now taken to writing them himself. Messrs. Longmans, Green, & Co. will shortly publish his "Prince Prigio," with illustrations by Gordon Browne. The prince is a great-grandson of the Giglio of Thackeray's "Rose and the Ring;" and many of the old fairy-tricks serve a new purpose in Mr. Lang's story.

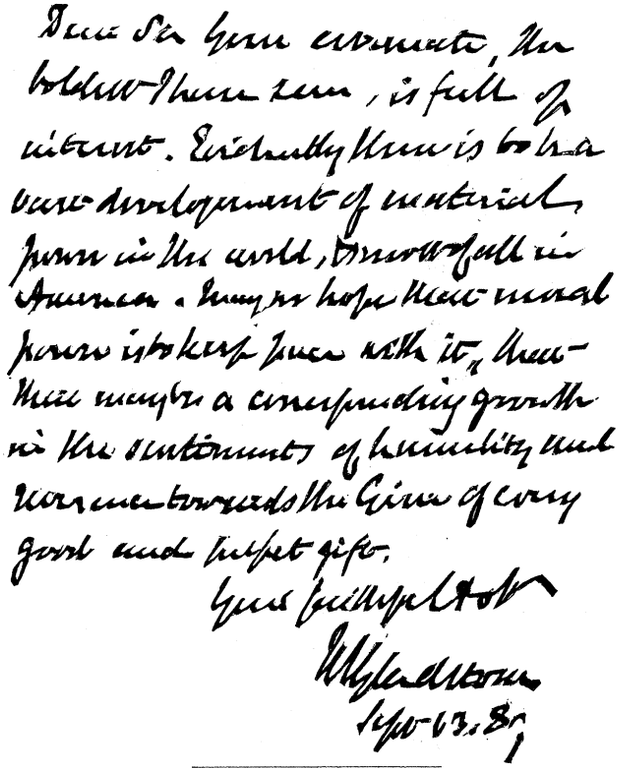
— There are ten articles in the October *Magazine of American History*. The frontispiece is a portrait of the late Samuel L. M. Barlow, accompanied with a poetical tribute from George Ticknor Curtis; also a sketch of the great lawyer by the editor. The opening article of the number, "The Romantic Beginnings of Milwaukee," by Roy Singleton, is one of those contributions which help to make American history grow more real and inviting to all classes: it is illustrated with portraits of some of the founders of Milwaukee. Following it is a study entitled "Georgia, the only Free Colony — How the Negro Came," by Professor H. A. Scomp of Emory College. Then comes "Kings, Presidents, and Governors of Georgia, 1732–1889," by Col. Charles C. Jones, jun., LL.D., of Georgia, which places material of curious significance on record. Opportune at this moment is a paper by Dr. George H. Moore of Lenox Library, on "The Discovery of America by Columbus," describing the celebrations in Boston and New York a hundred years ago, and showing the part taken in them by the Tammany Society. "The Antiquity of the Tupper Family," by Professor Tupper, is readable. "The Financial Condition of New York in 1832," contributed by Susan Fenimore Cooper, includes a letter written by J. Fenimore Cooper; "A Trip to Niagara in 1835 — Miss Caroline Spencer's Journal," gives views of the methods of travel and the sights to be seen in western New York fifty-four years ago; and among the shorter articles is a tribute to Oliver Wendell Holmes on his eightieth birthday.

— Bulletin No. 3 of the Ohio Agricultural Experiment Station, "Silos and Ensilage," is an account of some preliminary work done in 1888 in the study of the silo question. It includes an illustrated description of the silo of the station, hints respecting the culture and harvesting of corn for silage, and the report of a feeding experiment in which corn-silage was contrasted with sugar-beets. Bulletin No. 4, "Small-Fruits at the Ohio Experiment Station," gives the results of this season's experiments with strawberries, raspberries, and blackberries, also of an experiment showing the effect upon the keeping-quality of early and late picking of apples. Bulletin No. 5, "Wheat at the Ohio Experiment Station," gives the results of this season's experiments with wheat, including thick and thin seeding, early and late sowing, methods of sowing, and a comparison of sixty-five differently named sorts of wheat. Any of these bulletins will be sent free to any Ohio farmer on application to the experiment station, Columbus, O.

LETTERS TO THE EDITOR.

The United States, their Growth in Population in Two Hundred Years.

[The following letter was received from the Hon. W. E. Gladstone, in response to a copy of *Science* mailed him, containing Gen. M. C. Meigs's article on the above subject.]



The Pennsylvania Weather Review.

THE monthly weather review of the Pennsylvania State Weather Service for August last contains an isothermal map of the State for the normals of the month, whose atrocious absurdity is paralleled only by the isothermal maps of New Hampshire in the report on the geology of that State several years ago. The isotherm of 67° performs the extraordinary feat of branching three times in its traverse of Pennsylvania. Three other isotherms end abruptly within the limits of the State, apparently not knowing how to get out. The lobate isotherm of 71°, that enters the State from the south and includes Gettysburg, fails to surround the adjacent isotherm of 74°, which reaches Harrisburg. It is remarkable that a travesty like this should appear under the direction of the committee on meteorology of the Franklin Institute of Philadelphia.

W.

Reformed Spelling.

SO far, all attempts to introduce a reformation in spelling seem to have failed. The changes that are recommended by the philological societies and approved by scholars are disregarded, Mr. Ellis's "Glossic" has been before the public nearly twenty years, Dr. Hill's efforts for six years at Waltham produced no permanent effect, it is doubtful if Mr. Bell's "World English" will fare better, and Hosea Bigelow spelling is dropped by every one after they have wearied themselves over a few lines.

While so much study has been given to the changes that are desirable, the best way to introduce them has perhaps been less considered. The eye is educated to catch syllables and words at a glance, and soon tires of picking out letters, although their combination may represent the sounds of words correctly. It is true that children can be easily taught to read phonetics; but, as one who has learned a foreign language lays it aside in his native land, so does the phonetic expert for the printed matter he finds in daily use, and the language floats on, unchanged and stationary.

How much, then, is it wise to attempt? Can any changes be proposed acceptable to readers, and such that printers will use them? Instead of attempting to introduce a phonetic system that is perfect, it may be well to employ one that is practical, and better than that at present in use, but not differing from it enough to embarrass the reader, and to keep words of uniform spelling if the correct sound of the letters in them is misused. No new letters should be used; nor does the eye tolerate new symbols, nor the use of accents, to determine sounds. This narrows the field in which changes can be made, yet leaves it large enough to furnish a spelling that will recommend itself to printers, foreigners, and illiterates; while children instinctively adopt it, when they can escape from the tyranny of the spelling-book, because it is uniform, and regulated by analogy.

First as regards the vowel-sounds. There seems to be no good reason to change the short sound of *a*. Its sound as in *trade* is fixed by *e* mute in all words except four. Its sound as in *marry* is fixed by the double consonant. "Glossic" doubles *a* in *father*, and adds *u* in *water*. Short *e* need not be changed. It is lengthened when it is in a final syllable or followed by *e* mute, which Professor Marsh tells us requires four per cent of all printed matter. "Glossic" uses *ei* for long *i*, which does not displease the eye. Of the four sounds of *o*, that as in *tone* is controlled by *e* mute or by accent in pronunciation. The sound as in *move* occurs in twelve words, which may be memorized. Words with the sound as in *dove* might perhaps drop *e* mute. The *bête noire ou*, with its seven sounds, has already caused a rebellion, as in *plow* for the time-honored *plough*, and may gradually drop most of them.

Of the consonants, *c* is hard before *a*, *o*, *u*, which can easily be remembered, as it will be difficult to displace it by *k*; *g* has both hard and soft sounds before *e* and *i*, where *j* could be substituted, as *jenuine*. There would be few mourners at its burial should the printers condescend to drop *u* after *q*. The change to *tion* for *shun* is displeasing, and its pronunciation is uniform. The printing *dthis* for *this* is a stumbling-block in the way of any change.

The changes noted above are the principal ones that would go far to conform the spelling of the language to its pronunciation.

Perhaps the best way to have any changes adopted would be to have the most desirable printed on cards, to be kept in plain sight at every case of type, and have some editor who has the improvement of the language at heart print one article in his daily paper, with the approved spelling. If it is favorably received, increase it gradually as the readers approve it. The end can be gained by keeping the changes before the eye until they are accepted by habit.

W. C. Bryant used to say, "When you reformers agree among yourselves as to what you want, it will be time enough for us of the press to give the matter our attention." It cannot now be said that there is uncertainty as to the proposed reform. The action of the phonological societies, the efforts of linguists, the whole literature of phonetics, furnish a magazine to supply all that is needed to move upon the conservative forces that delay reform But the press should take the initiative; for with little effort they can make it familiar to every reader, and give it success. The results on the brotherhood of mankind will be such that every one who is in a position to forward the reform should take an active share in its introduction.

M.

INDUSTRIAL NOTES.

Electric Apparatus for South Africa.

OUR readers are well acquainted with the many electric-railway installations which have been made during the past two years, and with the fact that the manufacture of electric apparatus for this work has grown rapidly. It is now estimated that there are from 150 to 200 electric street-railways in this country, either in operation or in course of construction.

Electricity promises to be the coming medium for transmission of power not only for street-railways, but also for mining industries; and it is hard to imagine an agent for transmitting power which is more easily handled, and the apparatus for which is, on the whole, more economical and inexpensive.

Among the electric mining plants which are now being installed by American manufacturers of electric apparatus, who lead the rest of the world, are a number not only in this country, but

abroad; and it is no unusual thing to hear of another mining company which has decided to adopt electric power in its mines.

Among recent contracts which have been awarded the Sprague Electric Railway and Motor Company of New York for electric-mining apparatus is one which comes from Transvaal, South Africa; and it is interesting to note that the fame for American electric-mining apparatus for durability, economy, and convenience, is recognized in these fields as well as in this country. The company which is now installing Sprague apparatus in Transvaal is the Forbes-Reef Gold-Mining Company, who have ordered through Chester & Gibb, mining engineers of London, Eng., a complete electrical equipment for transmitting power, including four Sprague long-distance motors, and dynamos for transmitting 140 horse-power over a distance of three miles. The primal source of power is a waterfall situated about three miles distant from the mines as the crow flies. These points are connected by insulated wires, which are carried on poles.

At the power-station will be placed three Pelton wheels furnished by Frazer & Chalmers of Chicago. To each of two of these wheels will be belted one long-distance transmission constant potential Edison dynamo of 50,000 watts, or 67 horse-power, capacity each. To the other wheel will be belted a dynamo of the same type and voltage as the others, but of only 40,000 watts, or 55 horse-power, capacity. These dynamos are similar in appearance to the standard Edison dynamo which is used in incandescent lighting; but their winding is modified according to the regular Sprague system, adapting them for the long-distance transmission of power. These machines have an efficiency of over 95 per cent.

At the mines are located the four Sprague motors, which are belted direct to the mining-machinery. These motors are divided into two groups; two 20 horse-power Sprague motors and one 80 horse-power motor forming one group, and a single 20 horse-power Sprague motor forming the other group. Each group is supplied with current by a separate set of wires, thus practically insuring a constant flow of electricity under all circumstances.

The method of regulating the motors and keeping up a constant speed in spite of the varying loads thrown on the mining-machinery is accomplished by winding the motors in a special way, so that there is no mechanical governor to get out of order. The governor being in the winding, and consequently acting without making any movement, the motors are more durable, and the use of any complicated mechanical governor is avoided. The motors are to run on a constant potential circuit, and all the motors of each group are connected together from positive to negative wires, thus equalizing the strain on the dynamos when the loads are thrown on the motors. This method of connecting dynamos and motors is in use in all Sprague stations for the transmission of power; and it is much superior in reliability and economy to the series method of putting each motor on a separate connection. In principle it is the same as supplying a city with water by running city mains instead of using a separate conductor for each consumer.

The question of efficiency, or the amount of the primal power which is delivered at the farther end after the transmission, is one which is very important. Upon this point electric transmission compares very favorably with all other methods of transmitting power. In this case the efficiency of the entire system, from the turbine pulley to the mining-machines at the farther end, is about 70 per cent; that is, 70 per cent of the energy which is delivered from the turbine pulleys at the power-station is given off the motor pulleys for work.

New Electric Street-Railways.

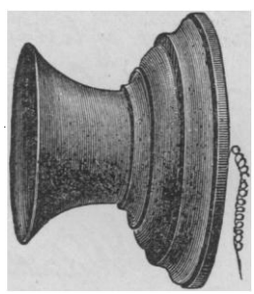
DURING the last week there have been a number of street-railway companies which have contracted for electric-railway apparatus in spite of the lateness of the season. The latest contracts closed by the Sprague Electric Railway and Motor Company of New York are for street-railways in Piqua, O., and South Nashville, Tenn.

The road at Piqua is an entirely new road, never having been operated by any power before. The number of cars which will be equipped will be four, and the line will extend for a few miles on the main streets of Piqua.

The South Nashville Street Railway Company will equip eight cars at present, but it is expected that the entire road will be run by electric power before long.

The Elliott Non-Electric Telephone.

A PATENT was recently issued to Larkin V. Elliott of Moorestown, Ind., for an improved form of mechanical or non-electric telephone, which seems to possess several advantages over other instruments of its class. The general appearance of this telephone is shown in the accompanying illustration. The mouth-piece is bell-shaped, and about four inches in diameter at its larger part, the bore narrowing to about an inch and a quarter where it joins the base. The aperture in the latter is cone-shaped, narrowing from about four inches in diameter where it joins the mouth-piece to half that size at the rear. Between the mouth-piece and the base the diaphragm is securely fastened. The diaphragm consists of two sheets of stretched rawhide, with an interposed layer of soft fibrous material and a covering of some soft fabric. It is made in the following manner. A sheet of thick rawhide is first stretched tightly across the aperture in the base, preferably while wet, so that when it dries it will be still more tightly drawn. Over this is laid a layer of cotton batting or other soft fibrous material. Over this a sheet of thin rawhide is stretched, but not as tightly as the



first sheet. Lastly comes a sheet of velveteen. The whole is secured firmly between the base and mouth-piece.

The line-wire passes through an opening in the centre of the diaphragm, being provided on its end with a button, which bears against the velveteen surface of the diaphragm. The inventor claims that this peculiar construction of the diaphragm, together with the shapes of the apertures in the base and mouth-piece, not only prevent the usual roaring sound in the receiver, but improve the sound by rendering it more distinct, reproducing a clear, natural tone of voice, similar to that which acts upon the diaphragm at the other end of the line-wire.

The claims of the inventor in regard to the good qualities of these telephones are borne out by the testimonials of many business-men who have had them in use for several months. They are intended only for short lines, from a few rods up to a couple of miles. Proper suspension devices are provided, so that the line-wire may be carried around angles without impairing the efficiency of the instruments. An electric call-bell may be used in connection with this telephone if desired.

American Apparatus in Italy.

WORK on the electric-railway apparatus for the Florence and Fiesole Road has been commenced upon at Schenectady, N.Y., which will be ready for shipment before long. This road will be operated entirely by electric power, and Sprague electric cars will be used throughout the entire line.

The road connects the city of Florence with the city of Fiesole, a distance of about five miles. The grades upon this line will be very severe, sufficiently so to have precluded the use of horses upon it. The regular Sprague system of overhead wires, using main conductor with feeders, will be used.

The fact that American railway apparatus have been adopted on this line is extremely flattering to the company to whom the order is given, and gratifying to the patriotism of every American. The fact that the Sprague system was brought into direct competition, in the matter of equipment of this road, with all the systems of electric street-railways in Europe, shows in an additional way the favorable reputation of American apparatus.